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BY

NATHANIEL COLSON, *Student in the Mathematics.*

The whole revis'd, and adjuſted to the NEW STILE,
By WILLIAM MOUNTAINE, *F.R.S.*

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To the Ingenious MARINER.

I Here preſent thee with a New Calendar, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing toomuch practiſed) but to make Things plain and practicable: Here is nothing obſcure or difficult to diſcourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainneſs (both as to Matter and Method) as poſſible; and I aſſure thee was I preſent to inſtruct thee, I could by no means render things more intelligible than I have here done: I have endeavoured to omit nothing that might be materially uſeful, having reſpect to the deſign'd bigneſs of the Volume The Contents are as follow:

The Principles of Arithmetic, with which I begin, becauſe I am ſenſible of the Loſs ſome have been at, that have attempted Navigation before they have underſtood ſomething of it; the Extraction of the Square and Cube Roots; In all which I have endeavoured to apply the Examples to Sea Affairs: Some neceſſary Geometric Problems, uſeful in Navigation; Directions for finding the Prime, Epact, Moon's Age, and the Time of Full Sea (both according to the ordinary and a more accurate Way) with Tables for the ſame.

Tables of the Sun's Place and Declination, with Directions and Examples to every Caſe, how to uſe the Declination to find the Latitude: As alſo the neceſſary Tables for correcting the Declination, when the Difference of Longitude is conſiderable from the Meridian of London, for which the ſaid Tables of Declination are calculated: A Table of the Sun's Right Aſcenſion: A Table of the Right Aſcenſion and Declination of ſome of the principal fixed Stars, with the uſe of the ſaid Tables in finding the time of a Stars coming to the Meridian; as alſo Directions at large for Obſervation of any of the ſaid Stars to find the Latitude of the Place, with Examples in each Caſe. The Deſcription of the Sea-Quadrant, Fore-ſtaff and Nocturnal: A Table of Latitude and Longitude of the principal Places on the Sea-Coaſt, collected from the beſt Information. Problems in Plane Sailing and Aſtronomy, (which that the Practitioners might learn two things at once) are wrought both by the Logarithms, and Gunter's Scale: A large and very uſeful Table of Difference of Latitude and Departure to every Degree and Quarter Point of the Compaſs; With its uſe in working a Traverſe in order to keep a Reckoning at Sea: A Rutter for the Coaſt of Great-Britain, France, Ireland, Spain, Portugal, &c. Shewing the Bearing and Diſtance from one Place to another: A Table of the Soundings coming into the Channel, giving the Depth of Water, and Quality of the Ground; Laſtly, Directions for ſailing into ſome principal Harbours; By all, or any of which, if thou art by any means profited (as I know thou mayeſt, if thou wanteſt Information in any of theſe Things, and doſt but carefully animadvertupon what thou readeſt) I have my End; And thy kind Acceptance hereof will furtheroblige

Thy ſincere Friend,

Nathaniel Colſon

The Principles of Arithmetic briefly and plainly demonſtrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Uſefulneſs and Neceſſity of ſome Knowledge of *Arithmetic*, in the Art of *Navigation*, it is requiſite to begin with that, without which no orderly Procedure can be made; and firſt of

Numeration.

Numeration is that part of *Arithmetic*, whereby one may rightly expreſs the Value of any Number propoſed.

All *Numbers* are expreſſed by theſe Characters following.

1,	2,	3,	4,	5,	6,	7,	8,	9,	0
One,	*Two*,	*Three*,	*Four*,	*Five*,	*Six*,	*Seven*,	*Eight*,	*Nine*,	*Cyphers*,

Altho' Cyphers ſignify nothing by themſelves, yet being put before (or o the Right-Hand of) other Figures, they increaſe their Value as much as if they were all Figures, as may plainly be ſeen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thouſands	1000
12345	X Thouſands	10000
123456	C Thouſands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are ſet in, as 1 in the firſt Place, or Places of *Units*, is *One*; in the ſecond Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thouſand*; in the fifth Place *Ten Thouſand*, &c.

The Table directs how properly to expreſs any given Number; As 123 which *Number* conſiſting of three Places, is thus numbered, *One Hundred Twenty Three*; this *Number* 123456, conſiſting of ſix Places, is thus expreſſed, *One Hundred, Twenty Three Thouſand, Four Hundred Fifty-ſix*; and this *Number* 123456789, conſiſting of nine Places, is thus numbered, *One Hundred Twenty-three Millions, Four Hundred Fifty-ſix Thouſands, Seven Hundred Eighty-Nine.*

ADDITION.

ADdition is that which makes but one Sum of ſeveral *Example.* Suppoſe four Men (A. B. C. D.) owe me ſeveral Sums of Money, I would know how much is due to me in the whole: I begin at the firſt Row towards the Right-Hand and ſay, 3 and 6 is 9 and 2 is 11, and 4 is 15; ſetting down the 5 under the Row added up; then I carry the 1 ten to the next Row, ſaying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; ſet down 9 under the Row, added up, and carry 1 to the next row, ſaying 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; ſet down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which becauſe this is the firſt row, I ſet down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thouſand, Nine Hundred, Ninety-five Pounds.*

A	oweth	3564
B	——	5432
C	——	3156
D	——	1843
		13995

Characters uſed in Arithmetick

l.	Pounds.
s.	Shillings.
d.	Pence.
°	Degrees.
′	Minutes.
″	Seconds.

Exam. 2. Suppoſe I have ſeveral Creditors to whom I owe ſeveral Sums of Money, I deſire to know the whole.

Beginning again (as before in *Addition*) at the Right-hand, I ſay 11 and 10 is 21, and 4 is 25, and 6 is 31; now conſidering how many Shillings there are in 31*d.* I find 2*s.* and 7*d.* whereof I ſet down the odd 7*d.* under the row of Pence, and carry the 2*s.* to the next row being Shillings, ſaying 2 and 4 is 6, and 8 is 14 and 9 is 23, and 11 is 34, that is 1*l.* 14*s.* ſet down 14*s.* and carry the 1*l.* to the next row, ſaying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; ſet down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; ſet down 2 and carry 1: Laſtly, 1 and 1 is 2; ſo that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence.*

l.	*s.*	*d.*
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

Examp. 3. Suppoſe at Sea, keeping my Reckoning in Degrees and Minutes, having ſix Days Difference of Longitude, I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, ſet down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; ſaying 1 that I carried and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7, ſo that the whole Difference of Longitude made theſe 6 Days, is 7 Degrees and 26 Minutes.

		°	′
1	Day	1	06
2	——	0	56
3	——	1	09
4	——	1	00
5	——	2	02
6	——	1	13
0	——	7	26

Subtract.

SUBTRACTION.

Subtraction is the taking of a leſs Sum out of a greater, and finding the Remainder.

	l.	s.	d.
Example. Suppoſe a Man oweth me	376	13	06
And hath paid me	211	05	08
I deſire to know what remains unpaid, which is	165	07	10

To work this I ſay, 8 from 6 I cannot, but conſidering there is 12 Pence contained in a Shilling, I add, 12 to 6, and ſay 8 from 18, and there remains 10, which ſet down under the Pence; and then having borrowed 1, I go to the next Row, and ſay, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I ſay, 1 from 6 there remains 5, and 1 from 7 there remains 6; and laſtly, 2 from 3, there remains 1: ſo there remains due of the ſaid Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppoſe the Diſtance between two Places to be 1000 Miles, and that I have ſailed 396, and deſire to know how many Miles I have to Sail.

Placing 396, under the 1000, I ſay, 6 from 0 I cannot, but 6 from 10 there remains 4; proceeding to the next Figure I ſay, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 0 I cannot; but 4 from 10, there remains 6: Laſtly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Miles
1000
396
604

Example 3. Suppoſe one Place in the Latitude of 51 Deg. 32 Min. N. and another in the Latitude of 42 Deg. 10 Min. N. I would know the Difference of Latitude between them.

To do which, ſubtract the leſs Latitude out of the greater thus; the leſſer being placed undermoſt, ſay, 10 from 32, there remains 22, which place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11, there remains 9; then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

d.	m.
51	32
42	10
9	22

So the Difference of Latitude is 9 Deg. 22 Min.

MULTIPLICATION.

Multiplication is that which ſerves inſtead of many Additions, by which any Number of a greater Denomination is brought into a leſs, as Pounds into Shillings, Shillings into Pence, and Pence into Farthings; Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by that number of the leſſer which is contained in one of the greater; as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and ſo of the reſt.

Multiplication conſiſts of Three Parts.

1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is neceſſary to inſert the following Table which is firſt to be committed to Memory.

The Multiplication TABLE.

2 times	2	is	4
	3		6
	4		8
	5		10
	6		12
	7		14
	8		16
	9		18
3 times	3	is	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27
4 times	4	is	16
	5		20
	6		24
	7		28
	8		32
	9		36
5 times	5	is	25
	6		30
	7		35
	8		40
	9		45
6 times	6	is	36
	7		42
	8		48
	9		54
7 times	7	is	49
	8		56
	9		63
8 times	8	is	64
	9		72
9 times	9	is	81.
10 times	10	is	100

Example 1. I demand how many Shillings there are in 5648*l.* To Anſwer this, multiply the given Number of Pounds by 20, Thus; The firſt being 0 Cypher, ſet down 0 underneath the firſt Figure; and then proceed to the next Figure, and ſay 2 times 8 is 16; ſet down 6 under the ſecond Figure and carry 1; then 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is 12, ſet down 2, and carry 1; laſtly, 2 times 5 is 10, and 1 that I carried makes 11. So that 5648*l.* multiplied by 20, makes 112960 Shillings.

```
     l.
   5648
     20
 ------
 112960
 ------
```

Ex. 2. In 276 Degrees how many Minutes?

First ſet down — — — — — 276

Then (becauſe 60 Minutes make a Degree) multiply by — — 60

The Product is — — — — — — 16560

So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

```
Ex. 3. Multiply ——— 8765437
By — — — — —             32
                  ---------
                   17530874
                  26296311
                  ---------
Product — — —     280493984
```

```
Multiply ——— 47632867
By — — —         4352
             --------
             95265734
           238164335
          142898601
         190531468
         ------------
         207298237184
```

Division.

Diviſion is that which ſerves inſtead of many *Subtractions*, and is uſeful in reducing all Numbers of a leſſer Denomination into a greater; as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and Shillings into Pounds. It conſiſts of Three Parts, *(viz.) Dividend* or the

Number to be divided; the Diviſor, or the Number to divide by; and the Quotient; alſo if any Number remain, it is called the Remainder.

Diviſ. *Divid.* *Quot.*
23) 7834 (340
69··
93
92
14 Rem.

Example 1. To divide 7834 by 23; firſt ſay, how many times 2 in 7; Or how often 23 in 78, the Anſwer will be 3 times, which place in the Quotient; then multiply the Diviſor 23 by 3, the Figure placed in the Quotient, ſaying 3 times 3 is 9, and 3 times 2 is 6, place theſe under the two firſt Figures of the Dividend, and draw a Line; ſubtracting 69 from 78, there reſts 9, which ſet underneath, and place a Point under 3, to ſhew that it is brought down; place it to the 9, then proceed, ſaying, how many times 23 in 93, or how many times 2 in 9, which will be 4 times; place 4 in the Quotient, by which multiply the Diviſor: Again, placing the Product which is 92 under 93, draw a Line and ſubtract it therefrom, the Remainder 1 put under the Line, and ſet down 4 the laſt Figure in the Dividend, putting a Point under it, and place it to the Remainder 1; then becauſe there remains but 14, being leſs than the Diviſor 23, and ſo cannot be taken out of it, place a Cypher in the Quotient, and the Work is finiſhed.

Diviſ. *Divid.* *Quot.*
6|0 36|0 (6
36
00

Example 2. In 360 Minutes how many Degrees? Here I divide by 60, becauſe 60 Minutes make a Degree, and becauſe the laſt Figure of the Diviſor is a Cypher, I cut it off, and with it the laſt Figure of the Dividend, which is here alſo a Cypher, and divide 36 by 6, (which is the ſame Thing as to divide 360 by 60) but becauſe 6 cannot be taken out of 3, therefore I ſay, how many times 6 is 36? The anſwer is 6 times: Which I place in the Quotient, and proceed to multiply the Diviſor 6, by the 6 placed in the Quotient, which produceth 36, which ſubtracted leaves 0; ſo that by this Work it appears, that in 360 Minutes there are 6 Degrees juſt.

Example. 3. A Ship taken by 253 Men, is valued at 59875 *l.* I demand each Man's Share, being equally divided?

Diviſor. *Dividend.* *Quotient.*
253) 59875 (236
506··
927
759
1685
1518
167 Remains

253
236
1518
759
506
167
Proof 59875

Firſt, ſay, how many times 2 in 5? The anſwer is two times, which place in the Quotient; then multiply the Diviſor 253 by 2, the Figure placed in the Quotient, ſaying 2 times 3 is 6, 2 times 5 is 10, ſet down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which ſet down under the 3 firſt

Figures of the *Dividend*, from whence being ſubtracted, ſet the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and ſet it after 92, the Remainder; then ſay, how often 2 in 9? Anſwer 3 times (for 4 will prove too many.) Then multiply the *Diviſor* 253, as before, by 3, the Figure laſt placed in the Quotient, and the Product will be 759, which being ſubtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, ſetting it after 168, the laſt Remainder: And again, aſk the Queſtion how often 2 is contained in 16? Anſwer 6 times; by which 6, which ſet in the Quotient, multiply the *Diviſor* 253; and the Product is 1518, which place under the laſt *Dividend*, and ſubtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finiſhed, each Man's Share being 236 *l.* and 167 *l.* over, which is to be divided among them; which may eaſily be done by multiplying 167 by 240, and dividing the Product by 253, give each Man's Share in Pence. The Proof is by multiplying 253 the *Diviſor* by 236 the *Quotient*; then taking in 167 the Remainder, under the 3 laſt Figures, the Product will make the ſame with the *Dividend*, as you ſee in the Operation.

The Rule of THREE,

IS that which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the firſt, and the Quotient of the ſaid Diviſon is the Anſwer to the Queſtion.

Example 1. If in 24 Hours a Ship ſails 130 Miles; how many Miles will ſhe ſail with the ſame Gale in 192 Hours or eight Days;

```
          Hours              Miles              Hours
           24  ————————————   130  ————————————  192
                                                 130
                                                ————
24)24960(1040 Miles in 192 Hours                5760
   24···                                         192
   ————                                        —————
    96                                         24960
    96
   ————
    00
```

Here 24 is the firſt Number, 130 the ſecond, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the ſecond and third Numbers together, and divide the Product thereof 24960, by 24 the fitſt Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours, the Time propoſed.

Example 2. If 1 lb. of Tobacco coſt 6*d.* what will 112 lb. coſt?

```
             112
               6
          ———————
          12)672 Pence (or 56 Shillings.
```

Here the firſt Number being an Unit, which neither multiplies nor divides, it ſaves the Labour of Diviſion; and the Anſwer is 672 *d.* for the

Anſwer will be of the ſame Name with the ſecond Number, which divided by 12 to bring them into Shillings, gives the Quotient 56 *s.* which is the Price of 112 lb. as required.

Example 3. If a Staff of 3 Yards long, give a Shadow of 2 Yards: How high is that Caſtle whoſe Shadow is 100 Feet?

Which Queſtion for the more ready Solution, ſtate thus:

If 6 Feet (which is two Yards) give 9 Feet, what will 100 Feet give?

By the Operation it appears the ſaid Caſtle muſt be 150 Feet high.

```
   9
6)900(150 Feet
  6
  ---
  30
  30
  ---
  00
```

Example 4. If 564 *l.* 12 *s.* 6 *d.* is to be divided amongſt 165 Men, how much is one Man's Share.

Firſt, Reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings as you are taught in Multiplication, and the Sum 11292, multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564 *l.* 12 *s.* 6 *d.* Then ſay,

If 165 Men have 135510 Pence, how many ſhall one Man have? And here you ſhould multiply 135510 by the laſt Number, but in this Caſe it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 Remaining are 5 Pence to each Man's Share.

Note, The 45 Remaining of the firſt Diviſion is only $\frac{45}{165}$ of one Penny, which is little more than a Farthing.

The Operation follows.

```
     564 l. 12 s. 6 d.
      20
    -----
    11292
       12
    -----
    22590
   11292
------------
165)135510(821 Pence          12)821(68 Shillings, equal
    1320..                       72.     to 3 l. 8 s. 5 d.
    ----                        ---
     351                        101
     330                         96
     ---                        ---
      210                         5
      165
      ---
       45
```

Note, That in the *Rule of Three*, the firſt and third Numbers muſt be both of one Denomination, and the ſecond muſt be brought into the loweſt Value expreſſed therein; as in the foregoing Example, I work not the Queſtion as it was firſt ſtated, but tranſpoſing the Numbers, I put the Denomination of Men firſt and laſt, and the Money in the Midſt, to anſwer to that Part of the Rule, which requires the firſt and third Numbers to be both of one Name. The Anſwer whereof in the preceeding Queſtion, as by the Operation appears, is 821 Pence; which reduced into Shillings, is 68 *s.* and 5 *d.* or 3 *l.* 8 *s.* 5 *d.* one Man's Share, as was required.

The next thing I ſhall briefly treat of is, *The Extraction of the* Square and Cube Roots, as alſo ſomewhat of their Uſe.

The Extraction of the Square Root.

Ex. 1. TO Extract the Square Root of 7056 proceed thus: Firſt, Point the given Number (that is, put a Prick over every other Figure, beginning at the firſt Figure at the Right-hand) and note by the Way, that ſo many Points as the ſaid Number admits over it, of ſo many Figures conſiſts the Root of the ſaid Number; then proceed, ſeeking the greateſt Square Number (which is a Number multiplied by itſelf) in the firſt Point towards the Left-hand (70) which is 64, conſtituted of 8 multiplied into itſelf; for 8 times 8 is 64. The Root of the Square Number which is 8, place in the Quotient, and ſubſcribe the Square Number (64) under the ſaid firſt Point, ſubtracting it therefrom, and ſetting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line on the Left-hand of the Dividend (656) double the Quotient, and place (*viz.* 16.) therein calling it the Diviſor, ſeek how often the Diviſor is contained in all the Figures of the Dividend, ſave the laſt to the Right-hand: (*viz.*) How many times 16 in 65? The anſwer is 4 times, which place in the Quotient, and alſo on the Right-hand of the Diviſor (16) then multiply the Diviſor (164) by the 4 laſt placed in the Quotient, and put the Product, which is 656, under the Dividend, ſubtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

```
  .  .
 7056(84 Root
 64
 --------
 164)656 Diviſor.
     656
 --------
     000
```

The Square Root is applied to Navigation as follows:

Any two Sides of a Right-angled Plane Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppoſe a Ship hath made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Diſtance to be required, the ſaid Diſtance is found by the Extraction of the Square Root, as follows:

The Rule. Square the Difference of Latitude and Departure ſeverally (that is, multiply each by itſelf) add theſe two Squares together, and extract the Square Root of this Sum, which will be the Diſtance required.

Example.

Difference of Lat.	87	The Departure	71	Square Diff. Lat.	7569
Multiplied by itſelf	87	Multip. by itſelf	71	Square Departure	5041
	609		71	their Sum	12610
	696		497		
The Square =	7569	The Square =	5041		

12610(112 the Diſtance req.
1
21)26
21
222) 510
444
66

By the Operation it appears, that the Diſtance, omitting the Fraction, is 112 Miles.

Example 2. Suppoſe a Ship's Diſtance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required; the ſaid Difference of Latitude is found by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Diſtance ſubtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required.

Example. The Diſtance ——— 111
Multiplied by itſelf ——— 111
111
111
111
Square of the Diſtance —— 12321
Square of Dep. ſubtract —— 3249
Remains — 9072

The Departure = 57
Multiplied by itſelf = 57
399
285
Sq. of Departur^{e} = 3249

9072(95 Diff. Lat. required
81
185)972
925
47

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Diſtance, ſubtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Brevity-ſake is omitted.

Having proceeded thus far in ſhewing the *Practitioner* how to find the Diſtance, Difference of Latitude and Departure (any two of them being given, without Trigonometry) I ſhall ſhew the Manner of finding the Courſe exact enough for common Uſe, without the ſaid Operation, which is done as follows.

The Proportion to find the Courſe; As the Sum of the Hypotenuſe (or Diſtance) and half the greater of the other two Legs *(viz.)* if the Difference of Latitude be moſt, half that, but if the Departure be moſt, half that; I ſay; As the Sum of theſe two, is in Proportion to the leſſer (or remaining) Leg; ſo is 86, to the Angle (in Degrees) oppoſite to the leſs Leg; which is the Courſe, when the Departure is leſs than the Difference of Latitude, otherwiſe 'tis the Complement of the Courſe.

Example. Admit a Ship's Diſtance to be 110; the Difference of Latitude to be 88, and the Departure 66, and the Courſe required.

Firſt, Add the Diſtance, and half the greater Leg into one Sum.

The Diſtance is —— —— —— —— —— 110
Half the greater Leg (88) is —— —— —— —— 44
The Sum — — —— —— —— —— —— 154

Having thus done, ſay, by the Rule of THREE.

As the ſaid Sum 154, is to 66 the leſſer Leg; ſo is 86, to the Courſe.

To bring out the odd Minutes, multiply the Remainder of the Diviſion 132 by 60, (the Number of Min. contained in a Degree) and divide the Product by the Diviſor (154) and the Quotient of the ſaid *Diviſion* gives for the Anſwer 51 Minutes: So that the Courſe required is 36 deg. 51 min.

```
          66
        ------
         516
        516
    -----------
154)5670(36 deg.  51 min.
     462         ------
    -----          132
    1056            60
     924    -----------
     ----- 154)7920(51
     132         770
                -----
                 220
```

Example 3. Extraction of the Square Root. Suppoſe a Rope 5 Inches Compaſs, and another Rope of double the Strength is required. The Dimenſions of the ſaid required Rope are found by the *Extraction of the Square Root:* For ſhould it be ſuppoſed that a Rope of 10 Inches Compaſs, is but double the Strength of a Rope of 5 Inches; upon Proof it is manifeſtly falſe, for the ſaid Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compaſs of the given Rope, (*viz.* 5.) and multiply that by itſelf; which Product (becauſe the other Rope is to be twice as ſtrong, multiply by 2, and the Square Root of the Product is the Compaſs of the Rope required.

```
                                                           Inch.
Example. The given Ropes Compaſs  5 Inches. Extract the Root 50(7
Multiplied by itſelf —— ——        5                          49
                               -----                        ----
The Square — —— —— ——            25
Multiplied by—— —— ——             2
                               -----
                                 50
```

So by this Operation it appears that a Rope muſt be 7 Inches and a little better, to be twice the Strength of the given Rope of 5 Inches Compaſs.

If it's deſired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compaſs of the one Rope is to the Square of the Compaſs of the other; ſo is the Weight of the one to the Weight of the other, Length for Length. *Ex.* Suppoſe a Cable of 10 Inch. to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say, as 100 (the Square of 10) is to 64 the Square of 8: So is 25 C. the Weight of one Cable to 16 C. the Weight of the other required.

Extraction of the Cube Root.

I Shall firſt, as neceſſary, inſert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

Cube of the Nine Digits.

1	001	4	064	7	343
2	008	5	125	8	512
3	027	6	216	9	729

Example 1. Extract the Cube Root of 12167.

Firſt, Point the given Number, *(i.e.)* put a Prick over every third Figure (beginning at the Right-hand) then ſeek the greateſt Cube in the firſt Point, *(viz.* 12) which is 8, the Cube Root whereof (which is 2) place in the Quotient; ſubtract the Cube (8) from the firſt Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Reſolvend, then draw a Line underneath it, then ſquare the Quotient 2, which is 4; multiply the ſaid Square (4) by 300, which makes 1200; place this under the Reſolvend, and call it the Triple Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add theſe two *(viz.)* Triple Square and Triple Quotient into one Sum, and call it the Diviſor; ſeek how often this Diviſor is contained in the Reſolvend, which is three times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 laſt placed in the Quotient, and ſubſcribe the Product underneath the Diviſor; ſquare the ſaid Figure (3) laſt placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the laſt Product; Cube the Figure (3) laſt placed in the Quotient, and place it under the preceding Product. Laſtly, add theſe three Products into one Sum, ſubtracting the ſaid Sum from the Reſolvend, ſubſcribe the Remainder; to which Remainder, had there been any more Figures, the next Point muſt have been brought down, and the preceding Work repeated from the ſquaring of the Quotient, until all the Figures are ſo brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

```
 12167 (23 Root
 8
 ______
  4167 Reſolvend
 ______
  1200 Triple Square
    60 Triple Quot.
 ______
  1260 Diviſor
 ______
  3600
   540
    27
 ______
  4167
 ______
   000
```

Example 2. *Applied*, Suppoſe a Ship of 300 Tun, 75 Feet by the Keel, 29 Feet and an half by the Beam, and 14 Feet Depth in the Hold; another Ship is deſired of the ſame Mould and Shape of 500 Tuns; the ſeveral Dimenſions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. Firſt, Cube the Length of the given Keel, which is done by multiplying it into itſelf, and then multiplying the Product by it again.

Then ſay by the Rule of Three: As 300 Tuns the one Ship's Burthen, to 500 Tuns the other Ship's Burthen; ſo is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length; Which being wrought by the Rule of Three, gives 703125: From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction three Cyphers are added to bring out the Fraction, the Work therewith being the ſame as if there had been more Figures in the propoſed Number; the Operation gives for the Length of the Keel required 88 Foot $\frac{9}{10}$ Parts.

Thus, having found one of the Dimenſions, the reſt may be found without the Extraction of the Root, by the Rule of Three.

Thus, ſuppoſe the next Thing I would find be her Breadth by the Beam, ſay, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *fere*; ſo 29 ½ Feet the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Feet. In the ſame manner you may find the Depth in the Hold, *&c.*

Example 3. Suppoſe an Iron Shot 4 Inches Diameter to weigh 9 lb. and the Diameter of a Shot of any other Weight, ſuppoſe of 72lb. required. This is alſo done by the Extraction of the Cube Root, as follows:

Firſt, ſay, by the Rule of Three.

As 9lb. the Weight of one Shot, to 72lb. the Weight of the other; ſo is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter, which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

```
       75 given Keel
       75
   ----------
      375
     525
   ----------
     5625
       75
   ----------
    28125
   39375
   ----------
   421875 Cube given Keel

   ·  ·
   703125(88 9/10 Root
   512
   ----------
   191125 Reſolvend
    19200 Triple Square
      240 Triple Quotient
   ----------
    19440 Diviſor
   ----------
   153600
    15360
      512
   ----------
   169472
   ----------
   21653000 Reſolvend
   ----------
    2323200 Triple ſq.
       2640 Trip. Quot.
   ----------
    2325840 Diviſor
   ----------
    20908800
      213840
         729
   ----------
    21123369
   ----------
      529631 Remainder.
```

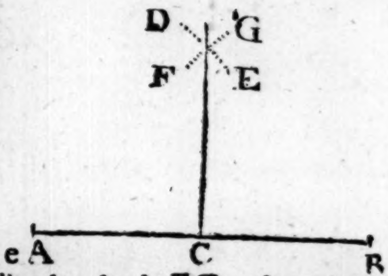
But if it was required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

As the Cube of one Shot's Diameter to the Cube of the other; ſo is the Weight of the one Shot, to the Weight of the other required?

And thus much for the *Arithmetical Part* of this Treatiſe.

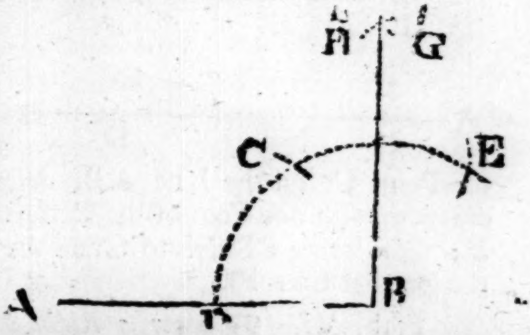
Some

Prob.. I. *To raiſe a Perpendicular from any Point propoſed, in a given Right Line.*



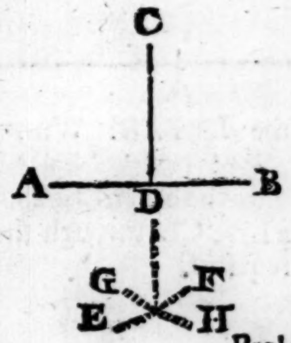
LET the Line given be A B, and the Perpendicular to be raiſed from the Point C; to do which ſet off the two equal Diſtances C A and CB. Then the Compaſſes being opened to any convenient Diſtance bigger than AC or CB, with one Foot of the Compaſſes in the Point A, deſcribe the Arch D E; then with the ſame Extent, and one Foot in the Point B, deſcrib the Arch FG, then draw the Perpendicular from the Point C, thro' the Interſection, (or cutting) of the two Arches FG and DE, which was required.

Prob. II. *To raiſe a Perpendicular on the End of a Line.*



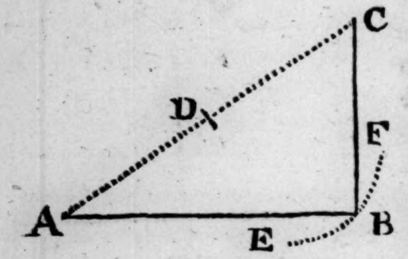
Let the Line given be AB, the Perpendicular to be raiſed from the Point B; to do which, with one Foot of the Compaſſes at B, with any convenient Diſtance, as BD, ſweep an Arch; then with the ſame Extent, one Foot of the Compaſſes being in the Point D, mark the ſaid Arch at the Point C, and one Foot being at C, mark it at E, then with the ſame Diſtance, one Foot of the Compaſſes being in the Point C, deſcribe the Arch F G; and placing the Compaſſes in the Point E, deſcribe the Arch H I; then from the Point B, and through the Interſection of the two Arches F G and H I, draw the Perpendicular which was required.

Prob. III. *To let fall a Perpendicular from a Point aſſigned, over a given Right Line.*



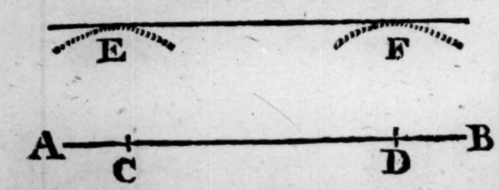
Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compaſſes in the Point C, then opening them to a convenient Extent, mark the Line AB in two Points with the ſaid Diſtance, as in the Points A and B; then with one Foot of the Compaſſes in the Point A, deſcribe the Arch EF, and with one Foot in the Point B, deſcribe the Arch G H; then from the Point C, and through the Interſection of the ſaid two Arches, draw the Perpendicular CD, which was required.

Prob. IV. *Another way to let fall a Perpendicular from a given Point, on a given Right Line.*



Let the Line given be AB, upon which it is required to let fall a Perpendicular from the Point C; to do which, from the Point aſſigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Point of the Compaſſes reſting in the Point D, with the ſame diſtance, (*viz.* of half the Line AC) deſcribe the Arch EF: Then from the Point C, to the Interſection of the Arch EF with the Line AB, draw the Perpendicular CB.

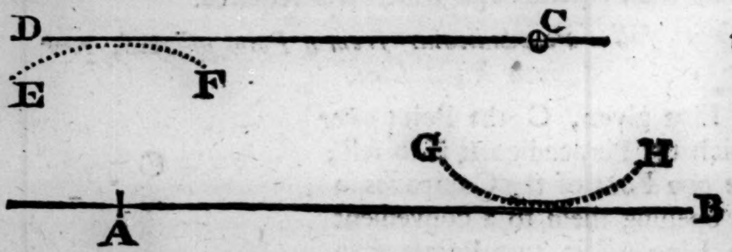
Prob. V. *To draw a Line parallel to a Line given.*



Let AB be a Line given, to which it is required to draw a Line parallel, to do which, firſt take in the Compaſſes the diſtance at which the parallel Line is to be drawn, and then ſetting one Foot of the Compaſſes in the Point C, on the Line A B, deſcribe the Arch E; and with the ſame diſtance, with one Foot of the Compaſſes in the Point D, deſcribe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line FE.

Prob. VI. *To draw a Right Line Parallel to a given one, that ſhall paſs through a Point given.*

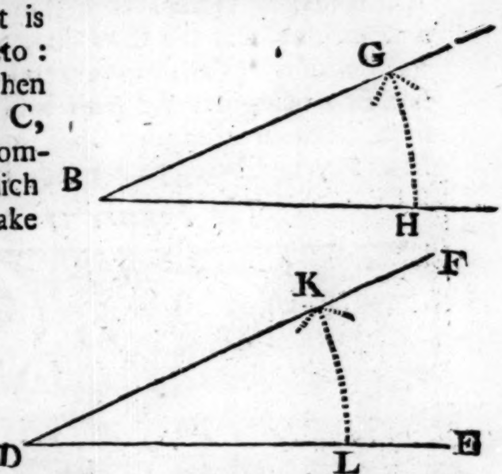
Suppoſe AB the given Line, and it's required to draw a Line Parallel thereto, that ſhall paſs thro' a given Point, as C.



Set one Foot of the Compaſſes in the Point C, and the other ſo far, as being turned about it may deſcribe an Arch GH juſt to touch, but not cut the Line AB: With the ſame Extent of the Compaſſes and one Point placed in the Line AB, at a convenient Diſtance from B, ſuppoſe in A, turn the other Leg about and deſcribe an Arch EF, then with a Ruler draw a Line CD through the Point C to touch the Arch EF, and it will be that required.

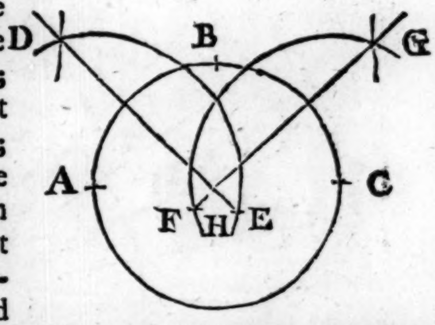
PROB. VII. *To make an Angle equal to any Angle given.*

Suppoſe B A C an Angle given, and it is required to make another Angle equal thereto: To do this, firſt draw the Line D E, then with any convenient Diſtance leſs than A C, deſcribe the Arch GH, then placing the Compaſſes at D, with the ſame Diſtance which ſwept the Arch GH ſweep the Arch KL; take he Arch GH in the Compaſſes, and ſetting one Foot in the Point L, croſs the Arch LK in the Point K, then through he Point K draw the Line DKF, then is he Angle E D F equal to the Angle BAC, as was required.



Prob. VIII. *To bring any three Points not ſituate in a Right Line, into the Circumference of a Circle.*

Let the three Points thro' which the Circle is to paſs be A,B,C: Take above half the Diſtance between the two Points A and B in the Compaſſes; and one Foot of the Compaſſes being in the Point A, with the ſaid Diſtance deſcribe the Arch ED; and with the ſame Diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch ED in the Points E and D, and draw the Right Line ED; then take above half the diſtance between the Points C and B in the Compaſſes, and one Foot of the Compaſſes being in the Point C, with the ſaid Diſtance deſcribe the Arch F G; and with the ſame diſtance, one Foot of the Compaſſes being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line F G. Now where the two Right Lines DE and FG, being continued, interſect each other (*viz.* in the Point H) is the Center of the Circle required.

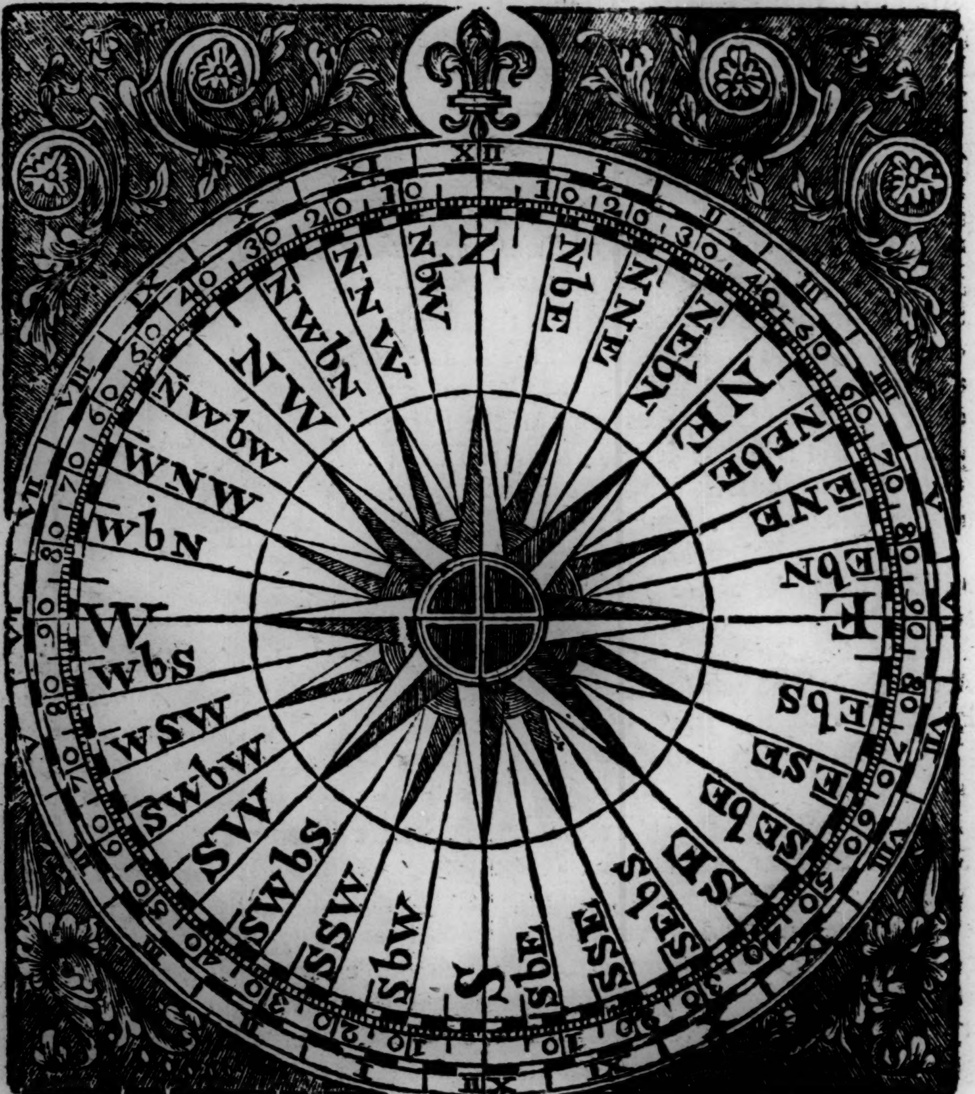


The Deſcription of the Mariner's Compaſs.

THIS Inſtrument, ſo beneficial an Aſſiſtant to the *Practical Part* of Navigation, as to its Inventor, is uncertainly diſcourſed of; its Age, by ſome ſuppoſed to be in theſe Parts of the World about 350 Years; the Utility whereof to us evidently appears, conſidering the many Inconveniencies that attended our Anceſtors, in tracing the vaſt Ocean, for want of ſuch a Guide, under whoſe ſubordinate Conduct of later Years, our Maritime Affairs have ſucceeded ſo well.

It is a Circle of a greater or leſſer Diameter at Pleaſure, deſcribed upon a Paſteboard, and divided into 360 Degrees, and 32 Points, (and ſometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure. The Circle being thus divided upon the Card or Paſteboard, there are paſted on the other Side of the ſaid Card or Paſte-board, two hardened Wires, or a thin Bar of Steel, which being touched with a Loadſtone, and the Card hung at the Center upon a Pin, fix'd in a Box, its Poſition (Variation excepted) becomes North and South; and the ſaid Box being cover'd with a Glaſs, is hung in another ſquare Box, in ſuch Manner that the Card may traverſe notwithſtanding the Ship's Motion; and being thus fixed, it is ready for Uſe.

The Figure of the Mariner's Compaſs.



To find the Prime or Golden Number.

THE *Prime* or *Golden Number*, is a Revolution of Nineteen Years, in which Term the Moon returns to make the ſame Aſpects with the Sun on the ſame Day of the Month (moſt commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains, the Prime is 19.

Example. To find the Golden Number for the Year 1768, add 1, which makes 1769; which divided by 19, the Quotient will be 93, and the Remainder 2, which is the Golden Number for the Year 1768.

N.B. The Golden Number is the ſame in both the Julian and Gregorian Account of Time.

To find the Epact.

THE Epact is the Number of Days which the Solar Year conſiſting of 365 Days, exceeds the Lunar (or twelve Revolutions of the Moon to the Sun) containing 354 Days, the Difference being 11 Days. When the Prime is 1, the Epact is 0; when 2, the Epact is 11; when 3, twice 11, or 22; when 4, thrice 11, or 33, or 3, omitting 30, (which muſt conſtantly be done when it exceeds 30;) and may be found in the following Manner.

Subtract 1 from the Prime, Multiply the Remainder by 11, and divide that Product (if it exceeds 30) by 30; the Remainder will be the Epact.

Example. Suppoſe it was required to find the Epact for the Year 1768.

The Prime for the Year 1768 is ———————— 2
From which ſubtract ———————————— 1
The Remainder is ———————————— 1

Which multiplied by 11 produces 11, which being leſs than 30, the Epact muſt be 11.

Note, After the Year 1799, there will require a different Method to find the Epact

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June*, 4, for *July* 5, for *Auguſt* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Take the Epact, the Number for the Month, according to the Rule foregoing, and the Day of the Month, for which the Moon's Age is required: Theſe three Sums added together, if leſs than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age ſubtracted from 30, leaves the Day of the Change. Again, 15 added to, or ſubtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppoſe it was required to find the Moon's Age for the firſt Day of *April*, 1768.

Firſt ſet down the Epact for that Year ———————— 11
To which add the Number of the Month ———————— 2
And the Day of the Month ———————— 1
The Sum, gives the Moon's Age ———————— 14

Then out of ——— 30
Take ——————— 14 The Moon's Age.
Remains ——— 16 Days to the next Change or New Moon.
From ——————— 15
Subtract ——————— 14 The Moon's Age.
Remains ——————— 1 Day to next Full Moon.

To find the Moon's Southing, and Time of Full-Sea, or High-Water; The Reader is here referr'd to the Tide-Table, Page 32, *&c.* and the Uſe thereof immediately following.

To find the Dominical Letter.

DIvide the Year and its fourth Part by 7, the Remainder ſubtracted from 7 gives the Dominical Letter; reckoning A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppoſe it was required to find the Dominical Letter for the Year 1768

Firſt, Set down the Year ——— ——— ——— ——— 1768
Then the 4th Part, (the remainder 3 omitted, which ſhews it to be the Third Year after Leap-Year,) is ——— } 442
The Sum is ——— ——— ——— ——— ——— ——— 2210

This Sum being divided by 7, the Quotient will be 315, and the Remainder 2, which being ſubtracted from 7, leaves 5; and conſequently the Dominical Letter is B: But being Leap-Year, there will be two Dominical Letters, and the Letter thus found ſerves from the laſt of *February* to the End of the Year; and the Letter next to that, reckoning them forward from A to G, is the Sunday Letter for the former part of the Year, to that Time.

N.B. After the Year 1799, the Order of the Dominical Letters, as they now range, will be diſturbed, and conſequently to find them, another Method muſt then take Place.

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppoſe it be required for the Year 1768
Then add ——— ——— ——— 9
Divided by ——— ——— ——— 28)1777(63
168
97
84
13

By the Operation it appears that 13 is the Cycle of the Sun for the Year 1768, being the Remainder after the Diviſion.

Note, *Hillary* Terms begins *Jan.* 23. and ends *Feb.* 12.

Eaſter Term begins 17 Days after *Eaſter-day*, and ends *Monday* before *Whitſunday*.

Trinity Term begins on *Friday* after *Trinity Sunday*, and ends nineteen Days after.

Michaelmas Term begins *November* 6, and ends *November* 29.

A Table of the Moon's Age for the Year 1768.

Months		D.	H
January	Full moon	4	4 M
	Laſt quart.	12	4 M
	New moon	19	6 A
	Firſt quart.	26	noon
Febru.	Full moon	2	8 A
	Laſt quart.	11	mid.
	New moon	18	6 M
	Firſt quart.	24	9 A
March	Full moon	4	2 A
	Laſt quart.	11	6 A
	New moon	18	4 A
	Firſt quart.	25	8 M
April	Full moon	2	8 M
	Laſt quart.	10	8 M
	New moon	17	1 M
	Firſt quart.	23	9 A
May	Full moon	2	1 M
	Laſt quart.	9	6 A
	New moon	16	9 M
	Firſt quart	23	noon
	Full moon	31	3 A
June	Laſt quart.	8	1 M
	New moon	14	5 A
	Firſt quart.	22	4 M
	Full moon	30	4 M

Months		D.	H.
July	Laſt quart.	7	6 M
	New moon	14	2 M
	Firſt quart.	21	9 A
	Full moon	29	2 A
Auguſt	Laſt quart.	5	11 M
	New moon	12	1 A
	Firſt quart.	20	3 A
	Full moon	28	1 M
September	Laſt quart.	3	4 A
	New moon	11	3 M
	Firſt quart	19	7 M
	Full moon	26	9 M
October	Laſt quart.	2	mid.
	New moon	10	8 A
	Firſt quart.	18	11 A
	Full moon	25	6 A
November	Laſt quart.	1	noon
	New moon	9	2 A
	Firſt quart.	17	noon
	Full moon	24	4 M
December	Laſt quart.	1	4 M
	New moon	9	8 M
	Firſt quart.	16	11 A
	Full moon	23	3 A
	Laſt quart.	30	11 A

Six Eclipſes this Year, three of the Sun, and three of the Moon.

The firſt is of the Moon, *January* the 4th, viſible 3 digits.
The ſecond is of the Sun, *January* the 19th, inviſible.
The third is of the Moon, *June* the 30th, inviſible.
The fourth is of the Sun, *July* the 14th, inviſible.
The fifth is of the Sun, *December* the 9th, inviſible.
The ſixth is of the Moon, *December* the 23d, inviſible.

A Table of the Moon's Age for the Year 1769.

Months		D	H.
January	New moon	8	1 M
	Firſt quart	15	9 M
	Full moon	22	3 M
	Laſt quart.	29	8 A
February	New moon	6	6 A
	Firſt quart.	13	4 A
	Full moon	20	5 A
	Laſt quart.	28	5 A
March	New moon	8	6 M
	Firſt quart.	14	mid
	Full moon	22	9 M
	Laſt quart.	30	1 A
April	New moon	6	5 A
	Firſt quart.	13	8 M
	Full moon	22	1 M
	Laſt quart.	29	5 M
May	New moon	6	1 M
	Firſt quart.	12	5 A
	Full moon	20	5 A
	Laſt quart.	28	5 A
June	New moon	4	9 M
	Firſt quart.	11	5 M
	Full moon	19	9 M
	Laſt quart.	27	1 M

Months		D.	H
July	New moon	3	3 A
	Firſt quart.	10	7 A
	Full moon	18	10 A
	Laſt quart.	26	7 M
Auguſt	New moon	1	11 A
	Firſt quart.	9	11 M
	Full moon	17	11 M
	Laſt quart.	24	1 A
	New Moon	31	10 M
Septem.	Firſt quart.	8	5 M
	Full moon	15	11 A
	Laſt quart.	22	6 A
	New moon	29	10 A
October	Firſt quart.	8	1 M
	Full moon	15	10 M
	Laſt quart.	22	1 M
	New moon	29	2 A
November	Firſt quart.	6	7 A
	Full moon	13	8 A
	Laſt quart.	20	noon
	New moon	28	8 M
December	Firſt quart.	6	noon
	Full moon	13	6 M
	Laſt quart.	20	1 M
	New moon	28	3 M

Five Eclipſes this Year, three of the Sun, and two of the Moon.

The firſt is of the Sun, *January* the 8th, inviſible.

The ſecond is of the Sun, *June* the 4th, viſible 7 digits.

The third is of the Moon, *June* the 19th, inviſible.

The fourth is of the Sun, *November* the 28th, inviſible.

The fifth is of the Moon, *December* the 13th, viſible 6 digits

A Table of the Moon's Age for the Year 1770.

Months		D.	H.
January	Firſt quart.	5	1 M
	Full moon	11	5 A
	Laſt quart.	18	6 A
	New moon	24	10 A
February	Firſt quart.	3	noon
	Full moon	11	4 M
	Laſt quart.	17	1 A
	New moon	25	4 A
March	Firſt quart.	4	8 A
	Full moon	11	4 A
	Laſt quart.	19	9 M
	New moon	27	6 M
April	Firſt quart.	3	3 M
	Full moon	10	5 M
	Laſt quart.	18	5 M
	New moon	25	5 A
May	Firſt quart.	2	10 M
	Full moon	9	6 A
	Laſt quart.	17	10 A
	New moon	25	1 M
	Firſt quart.	31	4 A
June	Full moon	8	9 M
	Laſt quart.	16	1 A
	New moon	23	9 M
	Firſt quar.	30	1 M

Months		D.	H
July	Full moon	7	mid.
	Laſt quart.	15	mid.
	New moon	22	4 A
	Firſt quart.	29	noon
Auguſt	Full moon	6	3 A
	Laſt quart	4	8 M
	New moon	20	11 A
	Firſt quart.	28	2 M
September	Full moon	5	6 M
	Laſt quart.	12	3 A
	New moon	19	8 M
	Firſt quart.	26	8 A
October	Full moon	4	8 A
	Laſt quart.	11	10 A
	New moon	18	8 A
	Firſt quart.	26	4 A
November	Full moon	3	9 M
	Laſt quart.	10	5 M
	New moon.	17	10 M
	Firſt quart.	25	1 A
December	Full moon	2	9 A
	Laſt quart.	9	2 A
	New moon	17	3 M
	Firſt quar.	25	8 M

There will be two Eclipſes this Year, and both of the Sun.

The firſt is of the Sun, *May* the 25th, inviſible.

The ſecond will be on *November* the 17th, inviſible.

A Table of the Moon's Age for the Year 1771.

Months		D.	H.
January	Full moon	1	9 M
	Laſt quart.	8	1 M
	New moon	15	10 A
	Firſt quart.	24	1 M
	Full moon.	30	7 A
Febru.	Laſt quart.	6	2 A
	New moon	14	6 A
	Firſt quart.	22	2 A
March	Full moon	1	6 M
	Laſt quart.	8	5 M
	New moon	16	noon
	Firſt quart.	24	1 M
	Full moon	30	4 A
April	Laſt quart.	7	1 M
	New moon	15	3 M
	Firſt quart.	22	7 M
	Full moon	29	2 M
May	Laſt quart.	6	3 A
	New moon	14	3 A
	Firſt quart.	21	1 A
	Full moon	28	1 A
June	Laſt quart	5	1 A
	New moon	13	1 M
	Firſt quart.	19	5 A
	Full moon	27	2 M

Months		D.	H.
July	Laſt quart.	5	5 M
	New moon	12	9 M
	Firſt quart.	18	11 A
	Full moon	26	4 A
Auguſt	Laſt quart.	3	7 A
	New moon	10	4 A
	Firſt quart.	17	8 M
	Full moon	25	8 M
September	Laſt quart	2	7 M
	New moon	9	1 M
	Firſt quart	15	8 A
	Full moon	23	mid.
October	Laſt quart.	1	5 A
	New moon	7	8 M
	Firſt quart.	15	noon
	Full moon	23	4 A
	Laſt quart.	31	2 M
November	New moon	6	7 A
	Firſt quart.	14	8 M
	Full moon	22	8 M
	Laſt quart.	29	10 M
December	New moon	6	8 M
	Firſt quart.	14	5 M
	Full moon	21	10 A
	Laſt quart	28	6 A

Four Eclipſes this Year, two of the Sun and two of the Moon.

The firſt is of the Moon, *April* the 29th, viſible 4 digits.
The ſecond is of the Sun, *May* the 14th, inviſible.
The third is of the Moon, *October* the 23d, ſets eclipſed.
The fourth is of the Sun, *November* the 6th, inviſible.

A Table of the Moon's Age for the Year 1772.

Months		D.	H.	Months		D.	H
January	New moon	4	11 A	*July*	Firſt quart.	7	7 A
	Firſt quart.	13	3 M		Full moon	14	9 A
	Full moon	20	11 M		Laſt quart.	22	8 A
	Laſt quart.	27	3 M		New moon	30	8 M
February	New moon	3	5 A	*Auguſt*	Firſt quart.	5	mid.
	Firſt quart.	11	9 A		Full moon	13	9 M
	Full moon	18	10 A		Laſt quart	21	noon
	Laſt quart.	25	2 A		New moon	28	4 A
March	New moon	4	noon	*September*	Firſt quart.	4	7 M
	Firſt quart.	12	1 A		Full moon	11	mid.
	Full moon	19	7 M		Laſt quart.	20	2 M
	Laſt quart.	26	3 M		New moon	27	1 M
April	New moon	3	5 M	*October*	Firſt quart.	3	5 A
	Firſt quart.	11	1 M		Full moon	11	5 A
	Full moon	17	4 A		Laſt quart.	19	5 A
	Laſt quart.	24	6 A		New moon	26	9 M
May	New moon	2	9 A	*November*	Firſt quart.	2	7 M
	Firſt quart.	10	10 M		Full moon	10	11 M
	Full moon	17	1 M		Laſt quart.	18	4 M
	Laſt quart.	24	10 M		New moon	24	8 A
June	New moon	1	11 M	*December*	Firſt quart	2	1 M
	Firſt quart.	8	3 A		Full moon	10	5 M
	Full moon	15	10 M		Laſt quart.	17	3 A
	Laſt quart.	23	3 M		New moon	24	8 M
	New moon	30	10 A		Firſt quar.	31	9 A

Six Eclipſes this Year, four of the Sun, and two of the Moon.

The firſt is of the Sun, *April* the 3d, inviſible.
The ſecond is of the Moon, *April* the 17th, inviſible.
The third is of the Sun, *May* the 2d, inviſible.
The fourth is of the Sun, *September* the 27th, inviſible.
The fifth is of the Moon, *October* the 11th, viſible and total.
The ſixth is of the Sun, *October* the 26th, inviſible.

A Table of the Moon's Age for the Year 1773.

Months		D.	H.
January	Full moon	8	10 A
	Laſt quart.	15	10 A
	New moon	22	10 A
	Firſt quart.	30	7 A
Febru.	Full moon.	7	noon
	Laſt quart.	14	6 M
	New moon	21	1 A
March	Firſt quart.	1	4 A
	Full moon	8	11 A
	Laſt quart.	15	3 A
	New moon	23	5 M
	Firſt quart.	31	10 M
April	Full moon	7	9 M
	Laſt quart.	14	1 M
	New moon	21	10 A
	Firſt quart.	29	10 A
May	Full moon	6	4 A
	Laſt quart.	13	noon
	New moon	21	2 A
	Firſt quart.	29	10 M
June	Full moon	5	noon
	Laſt quart.	12	1 M
	New moon	20	5 M
	Firſt quart.	27	4 A
July	Full moon	4	8 M
	Laſt quart.	11	5 A
	New moon	19	6 A
	Firſt quart.	26	9 A
Auguſt	Full moon	2	5 A
	Laſt quart.	10	10 M
	New moon	18	6 M
	Firſt quart.	25	3 M
September	Full moon	1	4 M
	Laſt quart.	9	4 M
	New moon	16	4 A
	Firſt quart.	23	9 M
	Full moon	30	6 A
October	Laſt quart.	8	11 A
	New moon	16	2 M
	Firſt quart.	22	5 A
	Full moon	30	11 M
November	Laſt quart.	7	3 A
	New moon	14	noon
	Firſt quart.	21	5 M
	Full moon	29	6 M
December	Laſt quart.	7	6 M
	New moon	13	10 A
	Firſt quart.	20	8 A
	Full moon	29	1 M

Four Eclipſes this Year, two of the Sun, and two of the Moon.

The firſt is of the Sun, *March* 23d, inviſible.
The ſecond is of the Moon, *April* 7th, inviſible.
The third is of the Sun, *September* 16th, inviſible.
The fourth is of the Moon, *September* 30th, part inviſible.

A Table of the Moon's Age for the Year 1774.

Months		D.	H.
January	Laſt quart.	5	6 A
	New moon	12	9M
	Firſt quart	19	3 A
	Full moon	27	7 A
Febru.	Laſt quart.	4	3M
	New moon	10	9 A
	Firſt quart.	18	2 A
	Full moon	26	11M
March	Laſt quart.	5	11M
	New moon	12	10M
	Firſt quart.	20	9M
	Full moon	27	11 A
April	Laſt quart.	3	5 A
	New moon	10	mid
	Firſt quart.	13	2M
	Full moon	26	9M
May	Laſt quart.	2	mid.
	New moon	10	3 A
	Firſt quart.	18	7 A
	Full moon	25	5 A
June	Laſt quart.	1	8M
	New moon.	9	6M
	Firſt quart.	17	7M
	Full moon	23	mid.
	Laſt quart.	30	7 A
July	New moon	8	9 A
	Firſt quart.	16	5 A
	Full moon	23	7M
	Laſt quart.	30	8M
Auguſt	New Moon	7	noon
	Firſt quart.	14	11 A
	Full moon	21	3 A
	Laſt quart.	28	mid
Septem.	New moon	6	2M
	Firſt quart.	13	5M
	Full moon	20	1M
	Laſt quart.	27	7 A
October	New moon	5	3 A
	Firſt quart.	12	11M
	Full moon	19	2 A
	Laſt quart.	27	3 A
November	New moon	4	2M
	Firſt quart.	10	7 A
	Full moon	18	6M
	Laſt quart.	26	11M
December	New moon	3	2 A
	Firſt quart.	10	5M
	Full moon	17	mid
	Laſt quart.	26	5M

There will be two Eclipſes of the Sun this Year.

The firſt on the 12th Day of *March*, inviſible.
The ſecond on the 6th Day of *September*, inviſible.

Months		D	H
January	New moon	2	1 M
	Firſt quart	8	6 A
	Full moon	16	8 A
	Laſt quart.	24	7 A
	New moon	31	11 M
Febru.	Firſt quart	7	10 M
	Full moon	15	2 A
	Laſt quart.	23	6 M
March	New moon	1	9 A
	Firſt quart.	9	4 M
	Full moon	17	7 M
	Laſt quart.	24	3 A
	New moon	31	8 M
April	Firſt quart.	7	11 A
	Full moon	15	10 A
	Laſt quart.	22	9 A
	New moon	29	8 A
May	Firſt quart.	7	6 A
	Full moon	15	9 M
	Laſt quart.	22	2 M
	New moon	29	11 M
June	Firſt quart.	7	11 M
	Full moon	13	5 A
	Laſt quart.	20	8 M
	New moon.	27	11 A

Months		D.	H.
July	Firſt quart.	6	2 M
	Full moon	11	mid
	Laſt quart.	19	4 A
	New moon	27	1 A
Auguſt	Firſt quart.	4	2 A
	Full moon	11	7 M
	Laſt quart.	18	3 M
	New Moon	26	5 M
Septem.	Firſt quart.	3	1 M
	Full moon	9	3 A
	Laſt quart.	16	5 A
	New moon	24	9 A
October	Firſt quart.	2	10 M
	Full moon	9	1 M
	Laſt quart.	16	11 M
	New moon	24	noon
	Firſt quart	31	4 A
November	Full moon	7	1 A
	Laſt quart.	15	7 M
	New moon	23	3 M
	Firſt quart.	29	11 A
December	Full moon	7	8 M
	Laſt quart.	15	4 M
	New moon	22	3 A
	Firſt quart	29	8 M

Four Eclipſes this Year, two of the Sun, and two of the Moon.

The firſt is of the Moon, *February* the 15th, inviſible.
The ſecond is of the Sun, *March* 1ſt, inviſible.
The third is of the Moon, *Auguſt* 11th, inviſible.
The fourth is of the Sun, *Auguſt* 26th, inviſible.

A Table of the Moon's Age for the Year 1776.

Months		D.	H
January	Full moon	5	7 A
	Laſt quart.	14	1 M
	New moon	21	3 M
	Firſt quart.	27	6 A
Febru.	Full moon	4	2 A
	Laſt quart.	12	6 A
	New moon	19	1 A
	Firſt quart.	26	7 M
March	Full moon	5	9 M
	Laſt quart.	13	8 M
	New moon	19	11 A
	Firſt quart.	26	10 A
April	Full moon	4	3 M
	Laſt quart.	11	5 A
	New moon	18	9 M
	Firſt quart.	25	3 A
May	Full moon	3	6 A
	Laſt quart.	10	mid.
	New moon	17	6 A
	Firſt quart	25	8 M
June	Full moon	2	6 M
	Laſt quart.	9	5 M
	New moon	16	4 M
	Firſt quart.	24	2 M

Months		D.	H.
July	Full moon	1	4 A
	Laſt quart.	8	2 M
	New moon	15	4 A
	Firſt quart	23	6 A
	Full moon	30	mid.
Auguſt	Laſt quart.	6	3 A
	New moon	14	5 M
	Firſt quart.	22	10 M
	Full moon	29	8 M
September	Laſt quart.	4	mid.
	New moon	12	9 A
	Firſt quart	19	11 A
	Full moon	27	4 A
October	Laſt quart.	4	11 M
	New moon	12	4 A
	Firſt quart.	20	10 M
	Full moon	27	2 M
November	Laſt quart.	3	4 M
	New moon	11	9 M
	Firſt quart.	18	8 A
	Full moon	25	1 A
December	Laſt quart,	2	11 A
	New moon	11	1 M
	Firſt quart.	18	4 M
	Full moon	25	1 M

Five Eclipſes this Year, three of the Sun, and two of the Moon.

The firſt is of the Sun, *January* the 21ſt, inviſible.

The ſecond is of the Moon, *Feb.* 5th, inviſible.

The third is of the Sun, *Feb.* the 19th, inviſible.

The fourth is of the Sun, *July* the 15th, inviſible.

The fifth is of the Moon, *July* the 30th, viſible 7 digits

The Uſe of the foregoing Tables of the Moon's Age.

IN the ſaid Tables the one half Page contains the firſt ſix Months of the Year, the other half the following ſix Months; in the firſt Column of each half, towards the Left hand are the Months; in the ſecond the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the ſaid New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A ſignifying Afternoon, M Morning: At the Bottom of each Table are the Eclipſes for that reſpective Year.

The Uſe of the Tables is, readily by Inſpection, to find the Day and Hour of the New, Full, or Quarters of the Moon.

Examp. 1. Suppoſe it was deſired to find the Time of New Moon, *Jan.* 1767. Firſt look for the Year 1767 on the Top of the Leaf, which having found, look for *January* in the firſt Column towards the Left-hand; then in the next Column in the ſame Month is found New Moon; and in the two following Columns againſt New Moon ſtands 30D. 2M. which ſhews that the New-moon in *January* 1767 is the 30th Day at 3 o'Clock in the Morning. The ſame Directions ſerve for the Full Moon, or firſt and laſt Quarter.

To find the Moon's Age ſubtract the Day of the Change or New Moon from the Day propoſed, the Remainder is the Moon's Age: Suppoſe therefore it was required to find the Moon's Age for *December* 17, 1774.

Looking in the Year 1774, the Table gives the Full Moon that Day, ſo that the Moon is about 15 Days old.

Example. Suppoſe it were required to find the Moon's Age on the 1ſt of *November*, 1767.

The laſt New Moon before the 1ſt of *Nov.* was *Oct.* 22d, but becauſe you cannot take 22 from 1, you muſt add 31 (the Number of Days in *Oct.*) and from the Sum ſubtract 22; The Remainder 10 is the Moon's Age required.

A TIDE-TABLE *for the Sea-Coaſts of* Great-Britain, Ireland, Norway, Holland, Flanders, France, Biſcay, *&c. Shewing what Moon makes full Sea, upon the Full and Change Days, at the Places following, rang'd in Alphabetic Order.*

A

	H	M
AT *Army* NNE. and SSW.	01	30
At *Amſterdam* & *Armentiers*, NE. and SW. ——	03	00
At *Abarwark*, ENE. and WSW. — — —	04	30
At *Albarmorich* & *Antwerp*, Eaſt and Weſt — — —	06	00
At *Aldborough*, SE. by S. and NW. by N. — —	09	45

	H.	M
B		
At *Beachy* and *Blacktail*, and before the *Race of Blanquet*, or *Blanchart*, N and S.	12	00
Thwart of *Beachy* in the *Offing*, N by E. and S by W.	00	45
At *Blackneſs*, in *Bluet*, at *Bell-Iſle*, NNE. and SSW.	01	30
Without *Bluet*, and at *Berwick*, NE by N. & SW by S.	02	15
The River of *Bourdeaux*, the South Coaſt of *Bretagne*, the Coaſt of *Biſcay*, and at *Buchaneſs*, NE. and SW.	03	00
At *Breſt*, before the *Baſe*, the River of *Bourdeaux* within the Haven, NE by E. & SW by W.	03	45
In the *Breeſound*, *Bloy*, *Baltimore*, ENE. and WSW.	04	30
Before *Bremen*, and at *Blackney*, and in the Channel before *Bourdeaux*, E. and W.	06	00
At *Briſtol* Key, E by S. and W by N.	06	45
At *Bridgwater*, E S E. and W N W.	07	30
At *Boulogne-deep*, SSE & NNW	10	30
C		
In *Condado*, N. and S.	12	00
In the *Chamber of Rye*, N by E. and S by W.	00	45
Without *Calais*, at *Corpus Chriſti* Point, before and at *Campvere*, NNE. and SSW.	01	30
Between *Calais* and *Dover*, before *Conquet*, and at the North Cape, NE. and SW.	03	00
At *Cork*, *Calais*, C. *Clear* and in the *Creek*, ENE. and WSW.	04	30
At *Caldy*, and in the Bay of *Carmarthen*, E by N & W by S.	05	15
At *Concale*, E. and W.	06	00
Without the *Caſkets*, in the Channel, SE by S. and NW by W.	08	15
Between *Guernſey*, and the *Caſkets*, before *Cromer*, before the *Caſkets* and *Guernſey*, *Seven Clifts*, and at *Catneſs*, SE. and NW.	09	00
At the *Caſkets*, and at *Chamberneſs*, SE by S. & NW by N.	09	45
At *Cows*, in the *Foſs of Caen*, in *Calais-Road*, and in *Chamberneſs-Road*, SSE and NNW.	10	30
Before the Haven of *Caen*, in the *Chamber*, between *Cripple-ſand* and the *Creyl*, and at *Calſhot*, S by E. and N by W.	11	15
D		
At *Dover-Pier*, and before *Dunkirk*, N and S.	12	00
At *Denbeigh* & *Downs* in the Road, NE by N. & SW by S.	02	15
At *Dort*, NE and SW.	03	00
At *Dungervan*, ENE. and WSW.	04	30
At *Dartmouth*, E. and W.	06	00
At *Dublin*, S E by E. and NW by W.	08	15
At *Dunbar*, SE. and NW.	09	00
At *Dungeneſs* and *Dunnoſe*, SE by S. and NW by N.	09	45
At *Dover*, *Dieppe*, and in the *Downs* a-ſhore S S E. and N NW.	10	30
E		
At *Embden*, before the *Elb*, before the *Eyder*, and before *Enchuſan*, N. and S.	12	00
At *Edam*, NNE. and SSW.	01	30
Before the Eaſtern & Weſtern *Emes*, and at *Engomonts*, SE. and NW.	09	00
F		
On the Coaſt of *Flanders*, N. and S.	12	00
At *Fluſhing*, N by E. and S by W.	00	45

	H.	M
Before the *Fen*, in the Channel, NNE. and SSW.	01	30
Without *Fountny*, NE by N. and SW by S.	02	15
Without the Banks of *Flanders*, NE. and SW.	03	00
At *Flamborough* and *Bridlington*, ENE and WSW.	04	30
At the *Forn* in *Fowey*, at *Falmouth*, E by N. and W by S.	05	15
Between *Fowey* & *Falmouth*, in the Channel, and at *Foulneſs*, E by S. and W by N.	06	45
Before the Coaſt of *Frizeland* and the *Fly*, ESE. and WNW.	07	30
Without the *Fly*, SE by E. and NW by W.	08	15
At *Frize* and *Fair-Iſle*, NW. and SE.	09	00
At the *Frith*, and at the *South Foreland*, SSE. and NNW.	10	30
In *Fair Iſle Roads*, and at the *North Foreland*, S by E. and N by W.	11	15
G		
In the Road of *Gibraltar*, at *Graveling*, and before *Cherburg*, N and S.	12	00
Before *Goeree*, at *Guernſey*, and at *Graveſend*, NNE. and SSW.	01	30
At *Groin*, at *Gaſcoign*, and the Coaſt of *Gallicia*, NE. and SW.	03	00
Between *Guernſey* & *Caſkets*, SE. and NW.	09	00
Thwart of *Guernſey* in the Channel, SE by S. and NW. by N.	09	45
In the *Chamber* and *Goeree-end*, S by E. and N by W.	11	15
H		
Before the *Hever*, before *Horn*, and at *Hampton*-Key, N and S.	12	00
Under *Holy* Iſland, and at *Horn*, NNE. and SSW.	01	30
Before *Hartlepool*, NE. and SW.	03	00
At *Huntcliff-foot*, NE by E. and SW by W.	03	45
At *Humber*, E by N. & W by S.	05	15
Before *Hamborough*, at *Hull*, at the *Holms*, and before *Humber's Mouth*, E and W.	06	00
At *Harlem*, *Havre de Grace*, and *Homehead*, SE and NW.	09	00
At St. *Helens*, at *Harwich*, and without the Banks of *Harwich*, SSE. and NNW.	10	30
At *Harwich* within, S by E. and N by W.	11	15
I		
At *Jutland* Iſlands, N. and S.	12	00
On the Weſt Coaſt of *Ireland*, NE. and SW.	03	00
In all the Havens of the South Coaſt of *Ireland*, E by N. and W by S.	05	15
K		
Kentiſh Knock, N. and S.	12	00
At *Kelliers*, NE. and SW.	03	00
At *Kingſale*, ENE & WSW.	04	30
At *Kilduyn*, ESE & WNW.	07	30
At *Keldive*, SE and NW.	09	00
L		
At *Leith*, North and South	12	00
At *Liſbon*, NE by N. and SW by S.	02	15
At *London*, NE and SW.	03	00
Thwart of *Lundey*, and before *Lynn*, E by N. and W by S.	05	15
At *Lynn* Half-Tide, at *Lundey*, Eaſt and Weſt	06	00
At *Lynn*, E by S. and W by N.	06	45

At

	H.	M
At the *Lizard* by the Land, ESE. and WNW. ———	07	30
At *Lambay*, SE. by E. and NW by W. ———	08	15
At *Leoſtaff*, and thwart of it without the Banks, SE by S. and NW by N. ———	09	45
In *Leoſtaff-Road* and at *Long-ſand-head*, SSE. and NNW.—	10	30
M.		
Within the *Maes*, at *Maldon*, N by E. and S by W. ———	00	45
Before the *Maes*, NNE. and SSW. ———	01	30
At the *Maes*, and before St. *Matthew*'s Point, NE by E. and SW by W. ———	03	45
In *Mouſehole*, at St. *Matthew*'s, and within *Mount's-bay*, ENE. and WSW. ———	04	30
In *Milford*, at *Moonleſs*, at St. *Maloes*, E by N. and W by S.	05	15
Between *Mouſehole* and *Falmouth*, and in *Milford-Haven*, ESE. and WNW. ———	07	30
In St. *Magnes* Sound, and at *Magnes* Caſtle, SE. by E. and NW by W. ———	08	15
At the *Iſle of Man*, SE &NW	09	00
Before *Maregate*, S by E. and N by W. ———	11	15
N.		
At *Newport* Half-tide, N & S	12	00
At the Weſt-end of the *Nore*, N by E. and S by W.———	00	45
Before the River of *Nantz*, NE. and SW. ———	03	00
At *Newcaſtle*, E by N & W by S.	05	15
Before St. *Nicholas*, E by S. and W by N. ———	06	45
At the *Needles*, at the Iſle of *Wight*, SE by E. & NW by W.	08	15
All the Coaſt of *Normandy*, and *Picardy*, SSE. and NNW.	10	30

		M
Between the *Naze* and *War-head* of *Lower*, S by E & N by W.	11	15
O		
At *Orkneſs*, NE and SW.—	03	00
At *Orkney*, SE and NW. —	09	00
At *Orfordneſs*, SE by S. and NW by N. ———	09	45
At *Orfordneſs*, without the Banks, and between *Orford* and *Orwell Waves*, SSE. & NNW.	10	30
At *Orfordneſs*, within the *Sands*, S by E. and N by W.	11	15
At *Oſtend*, N and S. ———	12	00
P		
At *Portſmouth* Half-Tide, N by W. and S by E. ———	11	15
At the *Pens*, *Porthus*, and *Poictu*, NE and SW. ———	03	00
On the Coaſt of *Portugal*, NE by E. and SW by W. —	03	45
In *Plymouth*, and before St. *Paul*'s, E by N. and W by S.	05	15
At St. *Paul*'s, in the Haven, E and W. ———	06	00
Before *Podeſſemeck*, E by S. and W by N. ———	06	45
Thwart of *Plymouth*, ESE. and WNW. ———	07	30
At the Race of *Portland*, SE. and NW. ———	09	00
Q		
At *Queenborough*, N. and S.	12	00
R		
At *Rocheſter*, N by E & S by W	00	45
At *Ramkins*, NNE. & SSW.	01	30
At *Rotterdam* in *Robin-Hood's* Bay, and from the Race to the *Pole-head*, NE. and SW. ———	03	00
At *Rouen*, and before *Rochel*, NE by E. and SW by W. —	03	45
In *Ramſey*, E by N & W by S.	05	15
S		
In the *Sleeve*, between *Uſhant* and *Scilly*, at the *Shoe*, at the		

	H.	M
Spits, at *Southampton*, and along the *Swin*, North and South —	12	00
Upon the Coaſt of *Spain*, and in *Shetland*, NE. and SW. —	03	00
At *Scilly*, the *Sound*, *Scarborough* & at *Staples*, NE by E & SW by W	03	45
At *Seven Iſles*, without the Haven, in the *Broad Sound*, ENE. and WSW. ———	04	30
At the *Mouth* of *Severn* between *Scilly* & the *Lizard*, at the *Spurn* and *Stockton*, E by N. & W by S.	05	15
Without *Scilly*, in the Channel, and at *Salcomb*, E. and W.	06	00
At *Sedmouth*, and at the *Start*, E by S. and W by N. ———	06	45
Off the *Start* in the Channel, ESE. and WNW. ———	07	30
Within the *Seine*, and before *Shelbergh*, at 7 *Clifts*, SE & NW.	09	00
At *Shoram*, SE by S & NW by N	09	45
At *Seine-head*, SSE. & NNW.	10	30
T		
Within *Tervere*, N by E. & S by W. ———	00	45
Before *Tervere*, before the River of *Thames*, and at *Tinmouth*, NNE. and SSW. ——	01	30
Before the *Tees* and *Tinmouth*, before the Bay of *Tinmouth*, NE. and SW. ———	03	00
At the Cliffs off the *Texel*, ENE. and WSW. ———	04	30
In *Torbay*, and before the *Texel*, E. and W. ———	06	00
In the Road of the *Texel*, ESE. and WNW. ———	07	30
At *Torgen*, S E. by S. and NW by N. ———	09	45
U		
Before *Ureck*, N. and S.	12	00
At *Uſe*, NE. and S.W ——	03	00
Between *Uſhant*, and the Main, NE by E. & SW by W.	03	45

	H.	M
In the *Vourd*, at the Bay, within *Uſhant*, ENE & WSW.	04	30
Without *Uſhant*, E and W.	06	00
St. *Vallery*, SSE. & NNW.	10	30
W		
At *Winchelſea*, N by E. and S by W. ———	00	45
At the *Weilings*, and from the Weſt-end of the *Wight*, NNE. and SSW. ———	01	30
Before the *Weilings*, NE by N. and SW by S. ———	02	15
At *Whitby*, NE. and SW.	03	00
In the Sea of *Wales*, and *Severn*, ENE. and WSW. ——	04	30
In *Wales*, E by N & W by S	05	15
At *Wells*, at *Weymouth*, and at *Waterford*, E. and W. ——	06	00
At *Weymouth* Key, E by S. and W by N. ———	06	45
At the *Neſs*, by *Wieringhen*, at *Winterton*, ESE. and WNW.	07	30
Thwart of the Iſle of *Wight*, in the Channel, all within the Iſle of *Wight*, between the Iſle of *Wight*, and *Beachy*, by the ſhore, SE by E. & NW by W.	08	15
At the E. end of the *Wight*, and on *Wieringhen* Flats, SE and NW. ———	09	00
Y		
Before *Yarmouth*, NNE. & SSW. ———	01	00
At *Youghall*, ENE. and W. SW. ———	04	30
At *Yarmouth*, SE by E. and NW by W. ———	08	15
In *Yarmouth* Road, in *Yarmouth* Haven, SSE. & NNW.	10	30
Z		
On the Coaſt of *Zealand*, NNE. and SSW. ———	01	30
In the *Zurick-ſea*, NE & SW.	03	00

THE foregoing Table ſhews the Time of Full Sea at the ſeveral Places therein contained, upon the Full and Change Days of the Moon, hich for more ready Uſe is put in Alphabetic Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days, be required.

Look into the Table under the Letter (L) it is found to flow at *London*, North Eaſt and South Weſt; that is, when it is Full Sea at *London*, the Moon will be, as it is vulgarly ſaid, upon the North Eaſt and South Weſt Points of the Compaſs, which is four Points, or 3 Hours.

The Uſe of this, together with the Moon's Southing, to find the Time of Full Sea at any Time, at any of the ſaid Places is ſhewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, the Quotient is the Time of Southing in Hours, and the Remainder is ſo many 12 min. of an Hour.

Note, If the Moon's Age exceeds 15, reject the ſaid 15, and take the Remainder, with which proceed inſtead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppoſe the Time of the Moon's Southing be required on the 1ſt of *November*, 1767. The Moon's Age is found to be 10 Days, which multiplied by 4 makes 40, which divided by 5, gives the Quotient 8 Hours the Time of the Moon's Southing in the Afternoon.

I ſhall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.		Time. H.	M.
1	16	0	48
2	17	1	36
3	18	2	24
4	19	3	12
5	20	4	00
6	21	4	48
7	22	5	36
8	23	6	24
9	24	7	12
10	25	8	00
11	26	8	48
12	27	9	36
13	28	10	24
14	29	11	12
15	30	12	00

The Uſe of the TABLE.

The firſt and ſecond Columns ſhews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old and her Southing required.

In the firſt Column under the Title Moon's Age ſtands 9; over againſt it in the laſt Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note alſo, The ſame Southing ſerves for 24 Days old which ſerves for 9 Days, as the Table ſhews; only obſerve that if the Moon be under 15 Days old, her Southing is in the Afternoon, but if above that Age, then in the Morning.

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppoſe the Moon to be 9 Days old, the Time of Full Sea in the *Downs* a-ſhore, is required.

By the foregoing Table it appears that a N N W. and S S E. Moon makes full Sea, which as the ſaid Table ſhews, is 10 Hours 30 Minutes; to which is added the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes (rejecting 12 Hours) in the Morning.

But to be more exact, uſe the following Table and Directions.

Moon's Age.		Time H.	M.
1	16	0	43
2	17	1	20
3	18	1	52
4	19	2	22
5	20	2	52
6	21	3	26
7	22	4	7
8	23	4	55
9	24	5	50
10	25	6	53
11	26	7	59
12	27	9	4
13	28	10	8
14	29	11	5
15	30	00	0

Having found the Time of Full Sea, upon the Full and Change Days, by the preceeding Table for that Purpoſe, enter this Table with the Moon's Age: Againſt which in the laſt Column are the Hours and Minutes to be added for the Time of Full Sea deſired.

Example.

Suppoſe as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* a-ſhore is required.

A N N W. and S S E. Moon makes full Sea, upon the Full and Change Days, which is 10 Hours 30 Minutes, this found enter the oppoſite Table with the Moon's Age 9 Days, againſt which ſtands 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact CALENDAR

OF

The Golden Number, Epact and Moveable Feaſts, until the Year 1787; as alſo of the Sun's Place an Declination to every Day of the Year, for the Firſt, Second, Third, and Leap-Year, calculated for, and from the Year 1762, and made to ſerve (without any conſiderable Error) till the Year 1777. Likewiſe the Sun's Riſing, whereby may be found the Time of the Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.

A TABLE of the Dominical-Letters, Cycle *of the* Sun, Prime, Epact, *and* Moveable Feaſts, *for* 26 *Years to come.*

Years.	Dom. Letter	Cycle of ⊙	Prime	Epact	Shrove-Sunday.		Eaſter-Sunday.		Whit-Sunday.	
1762	C	7	15	4	*February*	21	*April*	11	*May*	30
1763	B	8	16	15		13		3		22
1764	A G	9	17	26	*March*	4		22	*June*	10
1765	F	10	18	7	*February*	17		7	*May*	26
1766	E	11	19	18		9	*March*	30		18
1767	D	12	1	0	*March*	1	*April*	19	*June*	7
1768	C B	13	2	11	*February*	14		3	*May*	22
1769	A	14	3	22		5	*March*	26		14
1770	G	15	4	3		25	*April*	15	*June*	3
1771	F	16	5	14		10	*March*	31	*May*	19
1772	E D	17	6	25	*March*	1	*April*	19	*June*	7
1773	C	18	7	6	*February*	21		11	*May*	30
1774	B	19	8	17		13		3		22
1775	A	20	9	28		26		16	*June*	4
1776	G F	21	10	9		18		7	*May*	26
1777	E	22	11	20		9	*March*	30		18
1778	D	23	12	1	*March*	1	*April*	19	*June*	7
1779	C	24	13	12	*February*	14		4	*May*	23
1780	B A	25	14	23		6	*March*	26		14
1781	G	26	15	4		25	*April*	15	*June*	3
1782	DF	27	16	15		10	*March*	31	*May*	19
1783	E	28	17	26	*March*	2	*April*	20	*June*	8
1784	DE	1	18	7	*February*	22		11	*May*	30
1785	B	2	19	18		6	*March*	27		15
1786	A	3	1	0		26	*April*	16	*June*	4
1787	G	4	2	11		18		8	*May*	27

January hath XXXI Days.

Month Days	Week Days	Remarkable days, and fouthing of Stars at Midnight	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				First Year 1765 1769 1773 1777			
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♑		South		♑		South		♑		South		♑		South	
1	A	Circumfion.	11	11	23	02	10	56	23	02	10	41	23	03	11	26	22	59
2	B	Sun r. 5. 5.	12	12	22	56	11	57	22	57	11	42	22	57	12	27	22	54
3	C		13	13	22	50	12	58	22	51	12	44	22	51	13	28	22	48
4	D		14	14	22	43	13	59	22	45	13	45	22	45	14	29	22	42
5	E		15	15	22	36	15	01	22	38	14	46	22	39	15	30	22	35
6	F	Epiphany.	16	17	22	29	16	02	22	31	15	47	22	33	16	31	22	27
7	G		17	18	22	21	17	03	22	23	16	48	22	26	17	33	22	19
8	A	Caſtor &Polux	18	19	22	13	18	04	22	15	17	49	22	18	18	34	22	11
9	B	Procyon.	19	20	22	05	19	05	22	07	18	51	22	10	19	35	22	03
10	C		20	21	21	56	20	06	21	59	19	52	22	01	20	36	21	54
11	D	Sun r. 7. 56.	21	22	21	47	21	07	21	50	20	53	21	52	21	37	21	45
12	E		22	23	21	37	22	08	21	40	21	54	21	42	22	38	21	35
13	F		23	25	21	27	23	10	21	30	22	55	21	32	23	39	21	25
14	G		24	26	21	16	24	11	21	19	23	56	21	22	24	40	21	15
15	A		25	27	21	05	25	12	21	08	24	57	21	11	25	41	21	05
16	B		26	28	20	54	26	13	20	57	25	58	21	00	26	43	20	54
17	C		27	29	20	42	27	14	20	45	26	59	20	48	27	44	20	42
18	D		28	30	20	30	28	15	20	33	28	00	20	36	28	45	20	29
19	E		29	31	20	18	29	16	20	20	29	02	20	23	29	46	20	16
20	F	Sol in Aqua.	♒	32	20	05	♒	17	20	07	♒	03	20	10	♒	47	20	02
21	G		01	33	19	51	01	18	19	54	01	04	19	57	01	48	19	48
22	A	Sun r. 7. 44.	02	34	19	37	02	20	19	40	02	05	19	44	02	49	19	34
23	B		03	35	19	23	03	21	19	26	03	06	19	30	03	50	19	20
24	C		04	36	19	09	04	22	19	12	04	07	19	16	04	51	19	05
25	D	Conv. St. Paul	05	37	18	55	05	23	18	58	05	08	19	01	05	52	18	50
26	E		06	38	18	40	06	23	18	43	06	09	18	46	06	53	18	35
27	F		07	39	18	24	07	24	18	27	07	10	18	31	07	54	18	20
28	G		08	40	18	08	08	25	18	11	08	11	18	15	08	55	18	04
29	A		09	41	17	52	09	26	17	55	09	11	17	59	09	56	17	48
30	B	K. Charles M.	10	42	17	36	10	27	17	39	10	12	17	43	10	57	17	31
31	C		11	43	17	10	11	28	17	22	11	13	17	26	11	57	17	14

February hath XXVIII Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				First Year 1765 1769 1773 1777			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♒		South		♒		South		♒		South		♒		South	
1	D	Sun. r. 7. 28.	12	44	17	01	12	29	17	05	12	14	17	09	12	58	16	57
2	E	Purif. Mary	13	44	16	44	13	30	16	48	13	15	16	52	13	59	16	40
3	F		14	45	16	26	14	31	16	31	14	16	16	35	15	00	16	22
4	G		15	46	16	08	15	31	16	13	15	16	16	17	16	01	16	04
5	A		16	47	15	50	16	32	15	55	16	17	15	59	17	01	15	56
6	B		17	47	15	32	17	33	15	36	17	18	15	41	18	02	15	27
7	C		18	48	15	13	18	33	15	18	18	19	15	23	19	03	15	08
8	D		19	49	14	54	19	34	14	59	19	19	15	04	20	03	14	49
9	E		20	50	14	35	20	35	14	40	20	20	14	45	21	04	14	30
10	F		21	50	14	15	21	35	14	20	21	21	14	25	22	05	14	11
11	G		22	51	13	56	22	36	14	00	22	22	14	05	23	05	13	52
12	A		23	51	13	36	23	37	13	40	23	22	13	45	24	06	13	32
13	B		24	52	13	16	24	37	13	20	24	23	13	25	25	06	13	12
14	C	Valentine	25	52	12	55	25	38	13	00	25	23	13	05	26	07	12	51
15	D	Lyon's Heart	26	53	12	34	26	38	12	40	26	24	12	45	27	08	12	30
16	E	Lyon's Neck	27	53	12	13	27	39	12	19	27	24	12	24	28	08	12	09
17	F	Sun r. 7. 6.	28	54	11	52	28	40	11	58	28	25	12	03	29	09	11	48
18	G		29	54	11	31	29	40	11	37	29	25	11	42	♓	09	11	27
19	A	Sol in Piſces	♓	55	11	10	♓	40	11	16	♓	25	11	21	01	09	11	05
20	B		01	55	10	49	01	41	10	54	01	26	10	59	02	10	10	43
21	C		02	55	10	27	02	41	10	32	02	26	10	38	03	10	10	22
22	D	Sun r. 6. 49.	03	56	10	05	03	41	10	10	03	27	10	16	04	10	10	00
23	E		04	56	09	43	04	41	09	48	04	27	09	54	05	11	09	38
24	F	St. Matthias	05	56	09	21	05	42	09	26	05	27	09	31	06	11	09	16
25	E		06	57	08	59	06	42	09	04	06	27	09	09	07	11	08	54
26	A	Lower of the	07	57	08	37	07	42	08	42	07	28	08	47	08	11	08	31
27	B	two Foremoſt	08	57	08	14	08	42	08	20	08	28	08	25	09	11	08	09
28	C	in □ of great Bear.	09	57	07	51	09	42	07	57	09	28	08	02	10	12	07	46
29	D										10	28	07	39				
			When		it is		Leap-		Year		Feb.		hath	29	Days			

March hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				First Year 1765 1769 1773 1777			
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♓		South		♓		South		♓		South		♓		South	
1	D	David.	10	57	07	28	10	43	07	34	11	28	07	16	11	12	07	24
2	E		11	57	07	05	11	43	07	11	12	28	06	53	12	12	07	01
3	F		12	57	06	42	12	43	06	48	13	28	06	30	13	12	06	38
4	G	Sun r. 6. 29.	13	57	06	19	13	43	06	25	14	28	06	07	14	12	06	14
5	A		14	57	05	56	14	43	06	02	15	28	05	44	15	12	05	51
6	B		15	57	05	33	15	43	05	39	16	28	05	21	16	12	05	28
7	C		16	57	05	10	16	43	05	16	17	28	04	58	17	12	05	05
8	D		17	57	04	46	17	43	04	52	18	28	04	54	18	12	04	41
9	E		18	57	04	23	18	42	04	29	19	28	04	11	19	12	04	18
10	F		19	57	03	59	19	42	04	05	20	28	03	47	20	11	03	54
11	G	Sun r. 6. 14.	20	57	03	36	20	42	03	42	21	27	03	24	21	11	03	30
12	A		21	56	03	12	21	42	03	18	22	27	03	00	22	11	03	06
13	B	Lyon's Tail.	22	56	02	49	22	42	02	55	23	27	02	37	23	11	02	42
14	C	Lower of two	23	56	02	25	23	41	02	31	24	26	02	13	24	10	02	19
15	D	latter in □ of	24	56	02	01	24	41	02	07	25	26	01	49	25	10	01	55
16	E	great Bear.	25	55	01	37	25	41	01	43	26	26	01	25	26	09	01	32
17	F		26	55	01	14	26	40	01	20	27	25	01	01	27	09	01	08
18	G		27	54	00	50	27	40	00	56	28	25	00	38	28	09	00	44
19	A		28	54	00	26	28	39	00	33	29	24	00	14	29	08	00	21
20	B	Sol in Aries.	29	53	00	02	29	39	00	09	♈	24	Nor.	09	♈	08	Nor.	02
21	C	Upper of two	♈	53	No.	21	♈	38	Nor.	14	01	23	00	33	01	07	00	26
22	D	latter in □ of	01	52	00	44	01	38	00	38	02	23	00	56	02	06	00	50
23	E	great Bear.	02	51	01	08	02	37	01	02	03	22	01	20	03	06	01	14
24	F		03	51	01	32	03	36	01	26	04	21	01	44	04	05	01	37
25	G	Lady Day	04	50	01	56	04	36	01	50	05	21	02	08	05	04	02	01
26	A		05	49	02	19	05	35	02	13	06	20	02	31	06	04	02	24
27	B		06	48	02	43	06	34	02	37	07	19	02	54	07	03	02	48
28	C		07	48	03	06	07	33	03	00	08	18	03	17	08	02	03	11
29	D	Sun r. 5. 38.	08	47	03	30	08	33	03	24	09	17	03	41	09	01	03	35
30	E		09	46	03	53	09	32	03	47	10	16	04	04	10	00	03	58
31	F		10	45	04	16	10	31	04	10	11	16	04	27	11	00	04	21

April hath XXX. Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				First Year 1765 1769 1773 1777			
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♈		North		♈		North		♈		North		♈		North	
1	G	Laſt but two	11	44	04	39	11	30	04	33	12	15	04	50	11	59	04	44
2	A	inGreatBear's	12	43	05	02	12	29	04	56	13	14	05	13	12	58	05	07
3	B	Tail.	13	42	05	25	13	28	05	19	14	13	05	36	13	57	05	31
4	C	Sun r. 5. 31.	14	41	05	48	14	27	05	42	15	12	05	59	14	56	05	54
5	D		15	40	06	11	15	26	06	05	16	10	06	22	15	55	06	17
6	E		16	39	06	33	16	25	06	28	17	09	06	45	16	53	06	39
7	F		17	38	06	56	17	24	06	51	18	08	07	08	17	52	07	02
8	G	Virgin'sSpike	18	37	07	18	18	22	07	13	19	07	07	30	18	51	07	24
9	A	Laſt but one	19	35	07	41	19	21	07	35	20	06	07	52	19	50	07	46
10	B	inGreatBear's	20	34	08	03	20	20	07	57	21	05	08	14	20	49	08	08
11	C	Tail.	21	33	08	25	21	19	08	20	22	03	08	36	21	48	08	30
12	D	Sun r. 5. 12	22	32	08	47	22	17	08	42	23	02	08	58	22	46	08	52
13	E		23	30	09	09	23	16	09	04	24	01	09	20	23	45	09	14
14	F		24	29	09	30	24	15	09	25	24	59	09	42	24	43	09	55
15	G	Laſt ln great	25	28	09	52	25	13	09	47	25	58	10	03	25	42	09	57
16	A	Bear's Tail.	26	26	10	13	26	12	10	08	26	56	10	24	26	41	10	18
17	B	Sun r. 5. 6.	27	25	10	34	27	10	10	29	27	55	10	45	27	39	10	39
18	C		28	23	10	55	28	09	10	50	28	53	11	06	28	38	11	00
19	D		29	22	11	16	29	07	11	11	29	52	11	27	29	36	11	21
20	E	Sol, in Taurus	♉	20	11	37	♉	06	11	31	♉	50	11	47	♉	35	11	41
21	F	Sun r. 4. 55.	01	18	11	58	01	04	11	52	01	49	12	07	01	33	12	02
22	G	Dragon's Tail	02	17	12	18	02	03	12	12	02	47	12	27	02	31	12	22
23	A	St. George	03	15	12	37	03	01	12	32	03	45	12	47	03	30	12	42
24	B	Arcturus.	04	13	12	57	03	59	12	52	04	44	13	07	04	28	13	02
25	C	St Mark Evan	05	12	13	17	04	58	13	12	05	42	13	27	05	26	13	21
26	D		06	10	13	36	05	56	13	31	06	40	13	46	06	24	13	40
27	E		07	08	13	55	06	54	13	50	07	38	14	05	07	23	14	00
28	F	Day inc. 6. 55.	08	06	14	14	07	52	14	09	08	37	14	24	08	21	14	19
29	G		09	05	14	33	08	51	14	28	09	35	14	43	09	19	14	38
30	A		10	03	14	51	09	49	14	47	10	33	15	01	10	17	14	

May hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second 1762 1770		Year 1766 1774		Third 1763 1771		Year 1767 1775		Leap 1764 1772		Year 1768 1776		Firſt 1765 1773		Year 1769 1777	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♉		North		♉		North		♉		North		♉		North	
1	𝔅	Phil. & Jacob	11	01	15	09	10	47	15	05	11	31	15	19	11	15	15	14
2	ℭ		11	59	15	27	11	45	15	23	12	29	15	37	12	13	15	32
3	𝔇	Sun r. 4. 38.	12	57	15	45	12	43	15	41	13	27	15	54	13	11	15	50
4	𝔈		13	55	16	03	13	41	15	59	14	25	16	11	14	09	16	07
5	𝔉	Upper of two	14	53	16	20	14	39	16	16	15	23	16	28	15	07	16	24
6	𝔊	foremoſt in □	15	51	16	37	15	37	16	33	16	21	16	45	16	05	16	41
7	𝔄	of little Bear	16	49	16	53	16	35	16	50	17	19	17	02	17	03	16	58
8	𝔅	N. Scale of ♎	17	47	17	09	17	33	17	06	18	17	17	18	18	01	17	14
9	ℭ		18	45	17	25	18	31	17	22	19	15	17	34	18	59	17	30
10	𝔇		19	43	17	41	19	29	17	38	20	12	17	50	19	57	17	45
11	𝔈		20	40	17	57	20	26	17	54	21	10	18	05	20	55	18	01
12	𝔉		21	38	18	12	21	24	18	09	22	08	18	20	21	53	18	16
13	𝔊	Sun r. 7. 17.	22	36	18	27	22	22	18	24	23	06	18	35	22	51	18	31
14	𝔄	Brighteſt in	23	34	18	42	23	20	18	38	24	04	18	49	23	48	18	45
15	𝔅	the Crown	24	31	18	56	24	18	18	53	25	01	19	03	24	46	19	00
16	ℭ	Brighteſt in Serpent'sneck	25	29	19	10	25	16	19	07	25	59	19	17	25	42	19	14
17	𝔇		26	27	19	24	26	14	19	20	26	57	19	31	26	41	19	27
18	𝔈		27	25	19	37	27	11	19	33	27	54	19	44	27	39	19	40
19	𝔉		28	22	19	50	28	08	19	46	28	52	19	57	28	37	19	53
20	𝔊	Scorpion's Forehead.	29	20	20	03	29	06	19	59	29	50	20	09	29	34	20	06
21	𝔄	Sol in Gemini	♊	18	20	15	♊	04	20	12	♊	47	20	21	♊	32	20	18
22	𝔅	Sun r. 4. 5.	01	15	20	27	01	01	20	24	01	45	20	33	01	29	20	30
23	ℭ		02	13	20	38	01	59	20	36	02	42	20	44	02	27	20	41
24	𝔇		03	10	20	49	02	56	20	47	03	40	20	55	03	24	20	52
25	𝔈	Scorpion's Heart.	04	08	21	00	03	54	20	58	04	38	21	06	04	22	21	03
26	𝔉		05	06	21	11	04	51	21	09	05	35	21	16	05	20	21	14
27	𝔊		06	03	21	21	05	49	21	19	06	32	21	26	06	17	21	24
28	𝔄		07	00	21	31	06	46	21	29	07	30	21	36	07	15	21	34
29	𝔅	K C. II. B&R	07	58	21	40	07	44	21	39	08	27	21	45	08	12	21	43
30	ℭ	Sun. r. 3. 55.	08	55	21	49	08	41	21	48	09	25	21	54	09	09	21	52
31	𝔇		09	53	21	58	09	39	21	56	10	22	22	02	10	07	22	01

June hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				First Year 1765 1769 1773 1777			
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♊		North		♊		North		♊		North		♊		North	
1	E	Sun r. 3. 52.	10	50	22	06	10	36	22	04	11	20	22	10	11	04	22	09
2	F		11	47	22	14	11	33	22	12	12	17	22	18	12	02	22	17
3	G		12	45	22	22	12	30	22	20	13	14	22	25	12	59	22	24
4	A		13	42	22	29	13	28	22	28	14	12	22	32	13	56	22	31
5	B	Sun r. 3. 50	14	39	22	36	14	26	22	35	15	09	22	39	14	54	22	38
6	C		15	37	22	42	15	23	22	41	16	06	22	45	15	51	22	44
7	D		16	34	2	48	16	20	22	47	17	04	22	51	16	48	22	50
8	E		17	31	22	54	17	18	22	53	18	01	22	56	17	46	22	55
9	F		18	29	22	59	18	15	22	58	18	58	23	01	18	43	23	00
10	G		19	26	23	04	19	12	23	03	19	56	23	06	19	40	23	05
11	A		20	23	23	08	20	10	23	07	20	53	23	10	20	38	23	09
12	B	Sun r. 3. 48.	21	21	23	12	21	07	23	11	21	50	23	13	21	35	23	13
13	C		22	18	23	15	22	04	23	14	22	47	23	17	22	32	23	17
14	D		23	15	23	18	23	01	23	17	23	45	23	20	23	29	23	20
15	E		24	12	23	21	23	58	23	20	24	42	23	23	24	27	23	22
16	F		25	10	23	23	24	56	23	23	25	39	23	25	25	24	23	24
17	G		26	07	23	25	25	53	23	25	26	36	23	27	26	21	23	26
18	A		27	04	23	27	26	50	23	27	27	33	23	28	27	18	23	27
19	B		28	01	23	28	27	47	23	28	28	31	23	29	28	15	23	28
20	C		28	58	23	29	28	45	23	29	29	28	23	29	29	13	23	29
21	D	Sol in Cancer	29	56	23	29	29	42	23	29	♋	25	23	29	♋	10	23	29
22	E	Sun r. 3. 47.	♋	53	23	29	♋	39	23	29	01	22	23	29	01	07	23	29
23	F		01	50	23	28	01	36	23	28	02	20	23	28	02	04	23	28
24	G	John Baptiſt.	02	47	23	27	02	33	23	27	03	17	23	27	03	02	23	27
25	A		03	44	23	26	03	31	23	26	04	14	23	25	03	59	23	25
26	B		04	42	23	24	04	28	23	24	05	11	23	23	04	56	23	23
27	C	Brighteſt in	05	39	23	22	05	25	23	22	06	08	23	20	05	53	23	21
28	D	the Harp.	06	36	23	19	06	22	23	20	07	06	23	17	06	50	23	18
29	E	Peter Apoſtle.	07	33	23	16	07	19	23	17	08	03	23	14	07	47	23	15
30	F		08	30	23	13	08	17	23	13	09	00	23	11	08	45	23	11

July hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second 1762 1770		Year 1766 1774		Third 1763 1771		Year 1767 1775		Leap 1764 1772		Year 1768 1776		First 1765 1773		Yea 1769 1777	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♋		North		♋		North		♋		North		♋		North	
1	G		09	28	23	09	09	14	23	09	09	58	23	07	09	42	23	07
2	A		10	25	23	04	10	11	23	05	10	55	23	02	10	39	23	03
3	B		11	22	22	59	11	08	23	01	11	52	22	57	11	36	22	59
4	C		12	19	22	54	12	05	22	56	12	49	22	52	12	33	22	54
5	D		13	16	22	49	13	02	22	51	13	46	22	46	13	30	22	48
6	E		14	13	22	43	14	00	22	45	14	43	22	40	14	28	22	42
7	F	Sun r. 3. 53.	15	11	22	37	14	57	22	39	15	40	22	34	15	25	22	35
8	G		16	08	22	30	15	54	22	32	16	38	22	27	16	22	22	28
9	A		17	05	22	23	16	51	22	25	17	35	22	20	17	19	22	21
10	B		18	02	22	16	17	48	22	18	18	32	22	12	18	16	22	17
11	C	Sun. r. 3. 58.	18	59	22	08	18	40	22	10	19	29	22	04	19	14	22	06
12	D		19	57	22	00	19	43	22	02	20	26	21	55	20	11	21	58
13	E		20	54	21	51	20	40	21	53	21	23	21	46	21	08	21	49
14	F		21	51	21	42	21	37	21	44	22	21	21	37	22	05	21	40
15	G		22	48	21	33	22	34	21	35	23	18	21	28	23	03	21	31
16	A		23	46	21	23	23	32	21	26	24	15	21	18	24	00	21	21
17	B		24	43	21	13	24	29	21	16	25	12	21	08	24	57	21	11
18	C		25	40	21	03	25	26	21	05	26	10	20	57	25	54	21	00
19	D		26	37	20	52	26	24	20	54	27	07	20	46	26	52	20	49
20	E		27	35	20	41	27	21	20	43	28	04	20	35	27	49	20	38
21	F	Sun r. 4. 4.	28	33	20	29	28	18	20	32	29	02	20	24	28	46	20	27
22	G	Sol in Leo	29	30	20	17	29	15	20	20	29	59	20	12	29	43	20	15
23	A		♌	27	20	05	♌	13	20	08	♌	56	19	59	♌	41	20	03
24	B		01	24	19	03	01	10	19	56	01	53	19	46	01	38	19	50
25	C	James Apoſtle	02	21	19	40	02	07	19	43	02	51	19	33	02	35	19	37
26	D		03	19	19	27	03	05	19	30	03	48	19	20	03	33	19	24
27	E	Sun r. 4. 16.	04	16	19	14	04	02	19	17	04	46	19	06	04	30	19	10
28	F	Swan's Tail	05	13	19	00	04	59	19	03	05	43	18	52	05	29	18	56
29	G		06	11	18	46	05	57	18	49	06	40	18	38	06	25	18	42
30	K	Dog days be.	07	08	18	31	06	54	18	35	07	38	18	23	07	22	18	28
31	B		08	06	18	16	07	52	18	20	08	35	18	08	08	20	18	13

Auguſt hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				Firſt Year 1765 1769 1773 1777			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♌		North		♌		North		♌		North		♌		North	
1	C	Lammas.	09	03	18	01	08	49	18	05	09	33	17	53	09	17	17	58
2	D	Sun. r. 4. 20.	10	01	17	46	09	47	17	50	10	30	17	38	10	15	17	43
3	E		10	58	17	30	10	44	17	34	11	28	17	22	11	12	17	27
4	F		11	55	17	14	11	42	17	18	12	25	17	06	12	10	17	11
5	G		12	53	16	58	12	39	17	02	13	23	16	50	13	07	16	55
6	A		13	51	16	42	13	37	16	46	14	20	16	33	14	05	16	38
7	B		14	48	16	25	14	34	16	29	15	18	16	16	15	02	16	21
8	C		15	46	16	08	15	32	16	12	16	15	15	59	16	00	16	04
9	D		16	43	15	51	16	29	15	55	17	13	15	42	16	58	15	47
10	E		17	41	15	33	17	27	15	38	18	11	15	24	17	55	15	29
11	F	Sun r. 4. 35.	18	38	15	16	18	24	15	20	19	08	15	06	18	53	15	11
12	G		19	36	14	58	19	22	15	02	20	06	14	48	19	50	14	53
13	A	Sun r. 4. 39.	20	34	14	40	20	20	14	44	21	04	14	30	20	48	14	35
14	B		21	31	84	21	21	18	14	26	22	01	14	11	21	46	14	17
15	C		22	29	14	02	22	15	14	07	22	59	13	53	22	44	13	58
16	D		23	27	13	43	23	13	13	48	23	57	13	34	23	41	13	39
17	E		24	25	13	24	24	11	13	29	24	55	13	15	24	39	13	20
18	F		25	22	13	05	25	09	13	10	25	52	12	55	25	37	13	00
19	G		26	20	12	45	26	06	12	50	26	50	12	36	26	35	12	41
20	A		27	18	12	25	27	04	12	30	27	48	12	16	27	33	12	21
21	G	Sun r. 4. 43.	28	16	12	05	28	02	12	10	28	46	11	56	28	30	12	01
22	C		29	14	11	45	29	00	11	51	29	44	11	35	29	28	11	41
23	D	Sol in Virgo.	♍	12	11	25	29	58	11	30	♍	42	11	15	♍	26	11	21
24	E	Barthol. Ap.	01	10	11	05	♍	56	11	09	01	40	10	54	01	24	11	00
25	F		02	08	10	44	01	54	10	49	02	38	10	33	02	22	10	39
26	E		03	06	10	23	02	52	10	28	03	36	10	12	03	20	10	18
27	A		04	04	10	02	03	50	10	07	04	34	09	51	04	18	09	57
28	B		05	02	09	41	04	48	09	46	05	32	09	30	05	16	09	36
29	C		06	00	09	20	05	46	09	25	06	30	09	09	06	14	09	15
30	D	Sun r. 5. 13.	07	58	08	58	06	44	09	04	07	28	08	47	07	12	08	53
31	E		08	56	08	36	07	42	08	42	08	26	08	25	08	10	08	31

September hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1770	1766 1774	Third Year 1763 1771	1767 1775	Leap Year 1764 1772	1768 1776	Firſt Year 1765 1773	1769 1777
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M
			♍	North	♍	North	♍	North	♍	North
1	F	Fomelhaut	08 54	68 14	08 40	08 20	09 24	08 03	09 09	08 09
2	G	London b. 66	09 53	07 52	09 38	07 58	10 22	07 41	10 07	07 47
3	A	Firſt in Pegaſus's Wing.	10 51	07 30	10 37	07 36	11 21	07 19	11 05	07 25
4	B		11 49	07 08	11 35	07 13	12 19	06 57	12 03	07 03
5	C		12 47	06 46	12 33	06 51	13 17	06 35	13 02	06 41
6	D		13 46	06 24	13 32	06 29	14 16	06 12	14 00	06 19
7	E	Sun. r. 5. 28	14 44	06 01	14 30	06 07	15 14	05 50	14 58	05 56
8	F	Dog days end	15 42	05 38	15 28	05 44	16 12	05 27	15 57	05 33
9	G		16 41	05 16	16 27	05 22	17 11	05 04	16 55	05 10
10	A		17 39	04 53	17 25	04 59	18 09	04 41	17 54	04 47
11	B		18 38	04 30	18 24	04 36	19 08	04 18	18 52	04 24
12	C	Sun r. 5. 35.	19 36	04 07	19 22	04 13	20 06	03 55	19 51	04 01
13	D		20 35	03 44	20 21	03 50	21 05	03 32	20 49	03 38
14	E		21 33	03 21	21 19	03 27	22 04	03 09	21 48	03 15
15	F		22 32	02 58	22 18	03 04	23 02	02 46	22 46	02 52
16	G		23 30	02 35	23 16	02 40	24 01	02 23	23 45	02 29
17	A	Sun r. 5. 49.	24 29	02 11	24 15	02 17	24 59	02 00	24 44	02 06
18	B		25 28	01 47	25 14	01 53	25 58	01 36	25 42	01 43
19	C		26 26	01 24	26 12	01 30	26 57	01 13	26 41	01 20
20	D	Andro. head	27 25	01 01	27 11	01 07	27 56	00 49	27 40	00 56
21	E	Mathew Evan	28 24	00 38	28 10	00 44	28 55	00 26	28 38	00 33
22	F	Sun r. 6. o.	29 23	00 14	29 09	00 20	29 53	00 02	29 37	00 09
23	G	Sol inLibra	♎ 22	Sou. 09	♎ 07	Sou. 03	♎ 52	Sou. 21	♎ 36	Sou. 14
24	A	End of Pegaſus's Wing.	01 21	00 32	01 06	00 26	01 51	00 44	01 35	00 38
25	B		02 20	00 56	02 05	00 50	02 50	01 08	02 34	01 01
26	C		03 19	01 19	03 04	01 13	03 49	01 31	03 33	01 25
27	D		04 18	01 43	04 03	01 37	04 48	01 55	04 32	01 48
28	E	Sun r. 6. 9.	05 17	02 06	05 02	02 00	05 47	02 18	05 31	02 12
29	F	St. Michael	06 16	02 29	06 01	02 23	06 46	02 41	06 30	02 36
30	G		07 15	02 52	07 01	02 46	07 45	03 05	07 29	03 59

October hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774 ⊙ pla D	M	⊙ dec D	M	Third Year 1763 1767 1771 1775 ⊙ pla D	M	⊙ dec D	M	Leap Year 1764 1768 1772 1776 ⊙ pla D	M	⊙ dec D	M	First Year 1765 1769 1773 1777 ⊙ pla D	M	⊙ dec D	M
			♎		South		♎		South		♎		South		♎		South	
1	A	Sun r. 6. 13.	08	14	03	16	08	00	03	10	08	45	03	28	08	28	03	23
2	B		09	13	03	39	08	59	03	34	09	44	03	52	09	28	03	46
3	C		10	12	04	03	09	58	03	57	10	43	04	15	10	27	04	09
4	D		11	12	04	26	10	57	04	26	11	42	04	38	11	26	04	32
5	E	Pole Star.	12	11	04	49	11	57	04	44	12	42	05	01	12	25	04	55
6	F		13	10	05	12	12	56	05	07	13	41	05	24	13	25	05	18
7	G		14	10	05	35	13	55	05	30	14	40	05	47	14	24	05	41
8	A	Southermoſt in Andromeda's Girdle.	15	09	05	58	14	55	05	53	15	40	06	10	15	23	06	04
9	B		16	08	06	21	15	54	06	16	16	39	06	33	16	23	06	27
10	C	Sun r. 6. 29.	17	08	06	44	16	53	06	39	17	39	06	56	17	22	06	49
11	D		18	07	07	07	17	53	07	02	18	38	07	19	18	22	07	12
12	E	Sun r. 6. 35.	19	07	07	30	18	52	07	25	19	37	07	42	19	21	07	35
13	F		20	06	07	53	19	52	07	48	20	37	08	04	20	21	07	58
14	G		21	06	08	15	20	52	08	10	21	37	08	26	21	20	08	20
15	A		22	06	08	37	21	51	08	32	22	36	08	48	22	20	08	42
16	B		23	05	08	59	22	51	08	54	23	36	09	10	23	20	09	04
17	C		24	05	09	21	23	50	09	16	24	36	09	32	24	19	09	26
18	D	Luke Evan.	25	05	09	45	24	50	09	38	25	35	09	54	25	19	09	48
19	E		26	04	10	05	25	50	10	00	26	35	10	16	26	19	10	10
20	F		27	04	10	27	26	50	10	22	27	35	10	38	27	19	10	32
21	G	Sun. r. 6. 52.	28	04	10	48	27	50	10	43	28	35	10	59	28	19	10	54
22	A	Andromeda's	29	04	11	09	28	49	11	04	29	35	11	20	29	18	11	15
23	B	Southermoſt	♏	04	11	30	29	49	11	25	♏	35	11	41	♏	18	11	36
24	C	Foot. Sol in Scorpio	01	04	11	51	♏	49	12	46	01	35	11	02	01	18	11	57
25	D	Sun. r. 7. 4.	02	04	12	12	01	49	12	07	02	35	12	23	02	18	12	18
26	E		03	04	12	33	02	49	12	28	03	35	12	44	03	18	12	38
27	F		04	04	12	53	03	49	12	49	04	35	13	04	04	18	12	59
28	G	Simon & Jude	05	04	13	13	04	49	13	09	05	35	13	24	05	18	13	29
29	A		06	04	13	33	05	49	13	29	06	35	13	44	06	18	13	39
30	B	Sun. r. 7. 10	07	04	13	53	06	49	13	49	07	35	14	04	07	18	13	58
31	C		08	04	14	13	07	49	14	08	08	35	14	23	08	18	14	17

November hath XXX Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second 1762 1770		Year 1766 1774		Third 1763 1771		Year 1767 1775		Leap 1764 1772		Year 1768 1776		First 1765 1773		Year 1769 1777	
			⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec		⊙ pla		⊙ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♏		South		♏		South		♏		South		♏		South	
1	D	All Saints.	09	04	14	32	08	50	14	27	09	35	14	42	09	19	14	37
2	E	Sun. r. 7. 14	10	04	14	51	09	50	14	47	10	35	15	01	10	19	14	56
3	F		11	05	15	10	10	50	15	06	11	36	15	20	11	19	15	15
4	G	K. Will. Nat.	12	05	15	29	11	50	15	25	12	36	15	39	12	19	15	34
5	A	Powder Plot.	13	0	15	47	12	51	15	43	13	36	15	57	13	20	15	52
6	B		14	05	16	05	13	51	16	01	14	37	16	15	14	20	16	10
7	C		15	06	16	23	14	51	16	19	15	37	16	33	15	20	16	28
8	D		16	06	16	41	15	52	16	37	16	37	16	50	10	21	16	45
9	E		17	07	16	58	16	52	16	54	17	38	17	07	17	21	17	02
10	F	Sun r. 7. 29.	18	07	17	15	17	52	17	11	18	38	17	24	18	22	17	19
11	G	Martin B.	19	07	17	32	18	53	17	28	19	39	17	40	19	22	17	36
12	A		20	08	17	48	19	53	17	44	20	39	17	56	20	23	17	52
13	B	Sun r. 7. 34.	21	08	18	04	20	54	18	00	21	40	18	12	21	23	18	08
14	C		22	09	18	20	21	54	18	16	22	40	18	28	22	24	18	24
15	D		23	10	18	35	22	55	18	32	23	41	18	43	23	24	18	39
16	E		24	10	18	50	23	55	18	47	24	41	18	58	24	25	18	54
17	F		25	11	19	05	24	56	19	02	25	42	19	13	25	25	19	09
18	G		26	11	19	20	25	57	19	16	26	43	19	27	26	25	19	24
19	A		27	12	19	34	26	57	19	30	27	43	19	41	27	26	19	38
20	B		28	13	19	48	27	58	19	44	28	44	19	54	28	27	19	51
21	C		29	14	20	01	28	59	19	58	29	45	20	07	29	28	20	04
22	D	Sol in Sagit.	♐	14	20	14	29	59	20	11	♐	46	20	20	♐	29	20	17
23	E		01	15	20	27	01	♐ 00	20	24	01	46	20	32	01	30	20	30
24	F	Sun r. 7. 47.	02	16	20	39	02	01	20	36	02	47	20	44	02	30	20	42
25	G		03	17	20	51	03	02	20	48	03	48	20	56	03	31	20	54
26	A		04	17	21	02	04	03	20	59	04	49	21	08	04	32	21	05
27	B		05	18	21	13	05	03	21	10	05	50	21	19	05	33	21	16
28	C		06	19	21	24	06	04	21	21	06	51	21	30	06	34	21	26
29	D	Aldebaran.	07	20	21	34	07	05	21	31	07	51	21	40	07	35	21	36
30	E	Andrew Ap.	08	21	21	44	08	06	21	41	08	52	21	49	08	36	21	46

December hath XXXI Days.

Month Days	Week Days	Remarkable days, and ſouthing of Stars at Midnight.	Second Year 1762 1766 1770 1774				Third Year 1763 1767 1771 1775				Leap Year 1764 1768 1772 1776				Firſt Year 1765 1769 1773 1777			
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			♐		South		♐		South		♐		South		♐		South	
1	F	Sun r. 7. 58.	09	22	21	53	09	07	21	51	09	53	21	58	09	37	21	55
2	G		10	23	22	02	10	08	22	00	10	54	22	07	10	38	22	04
3	A		11	24	22	11	11	09	22	09	11	55	22	15	11	38	22	13
4	B		12	25	22	19	12	10	22	17	12	56	22	23	12	39	22	21
5	C		13	26	22	27	13	11	22	25	13	57	22	31	13	40	22	29
6	D		14	27	22	34	14	12	22	32	14	58	22	38	14	41	22	36
7	E		15	28	22	41	15	13	22	39	15	59	22	45	15	42	22	43
8	F		16	29	22	47	16	14	22	46	17	00	22	51	16	43	22	49
9	G		17	30	22	53	17	15	22	52	18	01	22	56	17	44	22	55
10	A		18	31	22	59	18	16	22	58	19	02	23	01	18	45	23	00
11	B	Sun r. 8. 5.	19	32	23	04	19	17	23	03	20	03	23	06	19	47	23	05
12	C	Firſt in Orion's Belt.	20	33	23	09	20	18	23	08	21	04	23	10	20	48	23	10
13	D		21	34	23	13	21	19	23	12	22	05	23	14	21	49	23	14
14	E	Laſt in Orion's Belt.	22	35	23	16	22	20	23	16	23	07	23	18	22	50	23	17
15	F		23	36	23	19	23	21	23	19	24	08	23	21	23	51	23	20
16	G		24	37	23	22	24	23	23	22	25	09	23	23	24	52	23	23
17	A	Orion's right ſhoulder and Auriga's right ſhoulder.	25	38	23	24	25	24	23	24	26	10	23	25	25	53	23	25
18	B		26	39	23	26	26	25	23	26	27	11	23	27	26	54	23	27
19	C		27	41	23	27	27	26	23	28	28	12	23	28	27	55	23	28
20	D	Sun r. 8. 9.	28	42	23	28	28	27	23	29	29	13	23	29	28	57	23	29
21	E	Thomas Ap.	29	43	23	29	29	28	23	29	♑	15	23	29	29	58	23	29
22	F	Sol in Capri.	♑	44	23	29	♑	29	23	29	01	16	23	29	♑	59	23	29
23	G		01	45	23	28	01	31	23	28	02	17	23	28	02	00	23	28
24	A	Foot of g. Dog	02	47	23	27	02	32	23	27	03	18	23	26	03	01	23	27
25	B	Nat. of Chriſt	03	48	23	25	03	33	23	26	04	19	23	24	04	02	23	25
26	C	St. Stephen	04	49	23	23	04	34	23	24	05	20	23	22	05	04	23	23
27	D	St. JohnEvan	05	50	23	21	05	35	23	22	06	22	23	20	06	05	23	20
28	E	Innocents	06	51	23	18	06	36	23	19	07	23	23	17	07	06	23	17
29	F	Mouth of the great Dog or Syrius.	07	52	23	14	07	38	23	16	08	24	23	13	08	07	23	14
30	G		08	54	23	10	08	39	23	12	09	25	23	09	09	08	23	10
31	A		09	55	23	06	09	40	23	08	10	26	23	04	10	10	23	06

A TABLE of the Variation of the Sun's Declination to every 15 Degrees of Longitude, from the Meridian of *London*.

Degrees of Longitude from the Meridian of LONDON.

Daily Vari.	Deg. 15	Deg. 30	Dg 45	Deg. 60	Deg. 75	Deg. 90	Deg. 105	Deg. 120	Deg. 135	Deg. 150	Deg. 165	Deg. 180
Min.	min.	min.	min.	min.	min.	min.	min	min.	min.	min.	min.	min.
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	02	03	03	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	03	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	02	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
21	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there are 11 Columns, the firſt ſhews the Day of the Month, the ſecond the Day of the Week, expreſſed by the Letters A, B, C, *&c.* the third the Southing of ſeveral Stars at Midnight, at which Time the ſaid Stars may (in the Abſence of the Moon, and Weather permitting) be obſerved, thereby to find the Latitude; in the ſame Column is given the Time of Sun-riſing, (and by ſubtracting the Time of riſing from 12 Hours gives the Time of ſetting) the Eight following Columns ſhew the Sun's Place and Declination for Second Year after Leap-Year, Third, Leap-Year, and firſt Year after, according to their reſpective Titles.

For the more ready knowing of Leap-Year, the following Table is inſerted, where is found by Inſpection, in the Third Column, and then follow the Firſt, Second, and Third Years after Leap-Year.

Second Year.	Third Year.	Leap Year.	Firſt Year.
1762	1763	1764	1765
1766	1767	1768	1769
1770	1771	1772	1773
1774	1775	1776	1777
1778	1779	1780	1781
1782	1783	1784	1785
1786	1787	1788	1789
1790	1791	1792	1793

The Uſe of the CALENDAR.

To find the Day of the Week or Month for any Time paſt, or to come, by the Calendar.

Firſt, Find the Dominical Letter by the Year, then proceed as follows.

Example 1. Suppoſe it be required to find what Day of the Month will be the third *Wedneſday* in *March*, 1763.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be B, turn to the Month of *March*, and account B for *Sunday*, then the Letter E is for *Wedneſday*, and the Third *Wedneſday* is the 16th of *March*, which was required.

Example 2. What Day of the Week will the ſecond of *September* be on in the Year 1772?

This Year being Leap-Year has two Dominical Letters E and D; the firſt Letter, to wit, E, ſerving from the firſt of *January* to the End of *February*; the laſt Letter, to wit D, ſerves from thence to the Years end.

Wherefore looking againſt the ſecond of *Sepeember*, there ſtands G, which repreſents *Wedneſday*, the Day of the Week required.

To

To find the Sun's Place and Declination by the Calendar.

Example 1. Suppoſe the Sun's Place and Declination be required on the 10th of *January*, 1764, being Leap-Year.

In the Month of *January* in the firſt Column look the Day of the Month, over againſt which, under Leap-Year ſtands 19.52, that is, the Sun's Place is in 19 deg. 52 min. of *Capricornus:* In the next Column under the ſaid Year ſtands 22.01, under the Title South, which ſhews the Declination to be 22 deg. 01 min. Southerly; and this alſo will practically ſerve for the Year 1776, for the ſaid 10th of *January*, being Leap-Year.

Example 2. Suppoſe the Sun's Place and Declination is required on the 10th of *March*, 1766, being the ſecond after Leap-Year.

In the Month of *March*, in the firſt Column find the Day of the Month, over-againſt which, under Second Year, ſtands 19.57 which ſhews the Sun's Place to be in 19 deg. 57 min. of *Piſces*; and in the next Column under Second Year, ſtands 03.59, which ſhews the Declination to be 03d 59m. Southerly, which was required.

Although it is common to take the Declination as it is in the Calendar, yet if the Difference of Longitude be conſiderable from *London*, it is requiſite the Declination ſhould be corrected, becauſe in the Calendar it is calculated for the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every* 15 *Degrees of Longitude from the Meridian of London*, immediately following the Calendar, is added; the Uſe and Explanation whereof follows.

IN the firſt Column of this Table is the daily Variation, which is found by ſubtracting the Declination of the given Day of the Month found in the Calendar, from the Declination for the Day following: or contrarily this from that, that is, the leſſer from the greater, and the Difference is the daily Variation: In the Head of the other Columns are Degrees of Longitude from *London*, either Eaſterly or Weſterly, and in thoſe Columns under the reſpective deg. of Longitude, are the Minutes of the Declination, anſwerable to the daily Variation: As ſuppoſe the daily Variation was 10 min. and the Difference of Longitude 90 deg. againſt 10 in the firſt Column, and under 90 deg. at the Head of the Table, ſtands 2 Minutes anſwering thereunto, and are to be uſed as follows.

The Uſe of the Table of the Variation of the Sun's Declination.

The Rule. Firſt, If the Difference of Longitude be Weſterly, and the Declination increaſing, the Variation found in this Table muſt be added to the Declination found in the Calendar; but if the Declination be decreaſing, it muſt be ſubtracted therefrom.

Secondly, If the Difference of Longitude be Eaſterly, and the Declination increaſing, the Variation aforeſaid muſt be ſubtracted; but the Declination decreaſing, it muſt be added.

Example 1. *April* the 19th, 1764, being at Sea, the Difference of Longitude from the Meridian of *London*, 90 degrees Weſterly, I find the

Declination in the Calendar to be 11 deg. 27 min. North; and the 20th Day, the Declination is 11 deg. 47 min. therefore ſubtracting the leſſer Declination from the greater, the Remainder is 20 min. which is the daily Increaſe; Then in the Table under 90 deg. and over againſt 20, ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination increaſing) muſt be added to 11 deg. 27 min. before found, which makes the true Declination 11 deg. 32 min. North.

If the Difference of Longitude in this Caſe had been Eaſterly, the 5 min. found in the Table muſt have been ſubtracted.

Note, It is eaſily diſcerned, whether the Declination increaſes or decreaſes, by obſerving whether the Declination for the Day following be greater or leſſer: For if it be greater, then it increaſes; but if leſs, then it decreaſes.

Example 2. *January* the 25th, 1763, being at Sea, the Difference of Longitude from *London*, 120 deg. Weſterly: I find the Declination in the Calendar to be 18 deg. 58 min. South, and the 26th Day it is 18 deg. 43 min. therefore ſubtracting the leſſer from the greater, the Difference is 15 min. which is the daily decreaſe; then in this Table under 120 deg. and againſt 15 ſtands 5 min. (which becauſe the Difference of Longitude is Weſterly, and the Declination decreaſing) muſt be ſubtracted, which makes the true Declination 18 deg. 53 min. South: If the Difference of Longitude had been Eaſterly, the 5 min. muſt have been added.

The Uſe of the Sun's Declination to find the Latitude.

The Knowledge of the Sun's Declination at any Time, and in any Longitude, is of great Importance at Sea, for by this, and the Complement of the Sun's Meridian Altitude (commonly called the Zenith Diſtance) taken with a Quadrant or Croſs-ſtaff, is found the Latitude of the Place the Ship is then in; to perform which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude, North.

Example. Suppoſe at Sea, the 10th of *April*, 1764, the Declination found by the Table is 8 deg. 14 min. North, the Sun comes to the Meridian in the South; the Complement of the Meridian Altitude by Obſervation is 23 deg. 10 min. What is the Latitude?

Complement of the Meridian Altitude is - -	23	10	South
Declination of the Sun is - - - - - - - - -	08	14	North
The Latitude of the Place is - - - - - - -	31	24	North

Rule 2. If the Sun comes to the Meridian in the North, and hath North Declination, then ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude, North: But if the Complement of the Altitude exceed the Declination, ſubtract the Declination therefrom, and the Remainder is the Latitude, South.

Example 1. Suppoſe at Sea, *May* 20, 1764, the Declination being 20 deg. 09 min. North, the Sun comes to the Meridian in the North, and by obſerving with a Quadrant the Sun's Zenith Diſtance is 18 deg. 42 min. What is the Latitude of the Place?

Sun's Declination is ——————— 20d. : 09m. North
The Sun's Zenith Diſtance——————— 18d. : 42m. North
The Latitude is ——————— 1d. : 27m. North

Example 2. At Sea, *June* 10th, 1763, the Sun's Declination by the Table is 23 deg, 5 min. North, the Complement of the Meridian Altitude by Obſervation is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude is—— 33d. : 10m. North
Sun's Declination ——————— 23d. : 03m. North
The Latitude is ——————— 10d. : 03m. North

Rule 3. If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude, South.

Example 3. At Sea, *January* 29th, 1764, the Sun comes to the Meridian in the North, the Complemenr of the Meridian Altitnde is 22 deg. 10 min. What is the Latitude ?

Complement of the Sun's Meridian Altitude is—— 22d. : 10m. North
Sun's Declination is ——————— 17d. : 59m. South
The Latitude is——————— 40d. : 09m. South

Rule 4. If the Sun comes to the Meridian in the South, and hath South Declination, ſubtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South: But if the Complement of the Meridian Altitude exceeds the Declination, ſubtract the Declination therefrom, the Remainder is the Latitude, North.

Example 1. At Sea, *Jannary* 1ſt, 1764, the Sun cometh to the Meridian in the South: The Complement of the Meridian Altitude is 10 deg. 36 min. What is the Latitude ?

Sun's Declination ——————— 23d. : 03m. South
Complement of Meridian Altitude ——————— 10d. : 36m. South
Latitude of the Place ——————— 12d. : 27m. South

Example 2. At Sea, *February* 18th, 1762, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude ?

Complement of the Sun's Meridian Altitude —— 25d. : 20m. South
Sun's Declination——————— 11d. : 31m. South
Latitude——————— 13d. : 49m. North

Rule 5. If the Sun or Star obſerved be in the (Zenith that is, right over Head) and has either North or South Declination, that Declination is the Latitude either North or South agreeable to the Name.

Rule 6. If the Sun or Star obſerved hath no Declination, the Complement of the Meridian Altitude is the Latitude, and is North or South, according as the Ship is to the Northwards or Southwards of the Sun.

A

A Table of the Sun's Right Aſcenſion.

Days	Jan.		Feb.		March		April		May		June	
	☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m
1	18	49	21	01	22	50	00	43	02	34	04	37
2	18	53	21	05	22	54	00	47	02	38	04	41
3	18	58	21	09	22	57	00	50	02	42	04	45
4	19	02	21	13	23	01	00	54	02	46	04	49
5	19	06	21	17	23	05	00	58	02	50	04	53
6	19	11	21	21	23	08	01	01	02	53	04	57
7	19	15	21	25	23	12	01	05	02	57	05	01
8	19	19	21	29	23	16	01	09	03	01	05	06
9	19	24	21	33	23	19	01	12	03	05	05	10
10	19	28	21	37	23	23	01	16	03	09	05	14
11	19	32	21	41	23	27	01	20	03	13	05	18
12	19	37	21	45	23	31	01	24	03	17	05	22
13	19	41	21	49	23	34	01	27	03	21	05	26
14	19	45	21	53	23	38	01	31	03	25	05	31
15	19	50	21	56	23	41	01	34	03	29	05	35
16	19	54	22	00	23	45	01	38	03	33	05	39
17	19	58	22	04	23	49	01	42	03	37	05	43
18	20	02	22	08	23	53	01	45	03	41	05	47
19	20	07	22	12	23	56	01	49	03	45	05	51
20	20	11	22	16	00	00	01	53	03	49	05	56
21	20	15	22	20	00	03	01	57	03	53	06	00
22	20	19	22	23	00	07	02	00	03	57	06	04
23	20	24	22	27	00	11	02	04	04	01	06	08
24	20	28	22	31	00	14	02	08	04	05	06	12
25	20	32	22	35	00	18	02	12	04	09	06	16
26	20	36	22	39	00	21	02	15	04	13	06	20
27	20	40	22	42	00	25	02	19	04	17	06	25
28	20	44	22	46	00	29	02	23	04	21	06	29
29	20	49			00	32	02	27	04	25	06	33
30	20	53			00	36	02	30	04	29	06	37
31	20	57			00	40			04	33		

Days	*July*		*Auguſt*		*Septem.*		*October*		*Novem.*		*Decemb*	
	☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.		☉ Right Aſcen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	06	41	08	46	10	42	12	30	14	27	16	31
2	06	45	08	50	10	46	12	34	14	31	16	35
3	06	49	08	54	10	49	12	38	14	35	16	39
4	06	54	08	57	10	53	12	41	14	39	16	44
5	06	58	09	01	10	57	12	45	14	43	16	48
6	07	02	09	05	11	00	12	49	14	46	16	52
7	07	06	09	09	11	04	12	52	14	50	16	57
8	07	10	09	13	11	07	12	56	14	54	17	01
9	07	14	09	17	11	11	13	00	14	58	17	06
10	07	18	09	21	11	15	13	03	15	03	17	10
11	07	22	09	24	11	18	13	07	15	07	17	14
12	07	26	09	28	11	22	13	11	15	11	17	18
13	07	30	09	32	11	25	13	14	15	15	17	22
14	07	35	09	36	11	29	13	18	15	19	17	27
15	07	39	09	39	11	33	13	22	15	23	17	32
16	07	43	09	43	11	36	13	25	15	27	17	36
17	07	47	09	47	11	40	13	29	15	31	17	41
18	07	51	09	51	11	43	13	33	15	35	17	45
19	07	55	09	54	11	47	13	37	15	40	17	50
20	07	59	09	58	11	51	13	41	15	44	17	54
21	08	03	10	02	11	54	13	44	15	48	17	59
22	08	07	10	06	11	58	13	48	15	52	18	03
23	08	11	10	09	12	01	13	52	15	56	18	08
24	08	15	10	13	12	05	13	56	16	01	18	12
25	08	19	10	17	12	09	14	00	16	05	18	17
26	08	23	10	20	12	12	14	03	16	09	18	21
27	08	27	10	24	12	16	14	07	16	13	18	25
28	08	30	10	28	12	19	14	11	16	18	18	30
29	08	34	10	31	12	23	14	15	16	22	18	34
30	08	38	10	35	12	27	14	19	16	26	18	39
31	08	42	10	39			14	23			18	43

A TABLE ſhewing the Right Aſcenſion, Declination, and Magnitude of the Principal Fixed Stars.

Names of the Stars.	Magnit.	Right Aſcen. h.	m.	Decli-nation d.	m.
END of Pegaſus's Wing, Algenib	2	00	01	13	51 N
Pole Star	2	00	44	88	01 N
Girdle of Andromeda	2	00	56	34	19 N
Bright Star in Aries	2	01	54	22	19 N
Meduſa's Head, Algol	2	02	52	40	00 N
Bright ſide of Perſeus	2	03	07	48	59 N
Aldebaran, or Bull's Eye	1	04	22	16	00 N
Capella, or the Goat	1	04	59	45	44 N
Bright Foot of Orion, Rigel	1	05	03	08	30 S
Middle Star in Orion's Belt	3	05	24	01	23 S
Orion's Right Shoulder	1	05	42	07	21 N
Auriga's Right Shoulder	2	05	40	44	54 N
Bright Foot of Gemini	2	06	24	16	35 N
Syrius, or the Great Dog	1	06	35	16	24 S
Caſtor, or Northermoſt Twin	2	07	19	32	23 N
Procyon, or the Little Dog	2	07	27	05	49 N
Pollux, or Southermoſt Twin	2	07	31	28	35 N
Hydra's Heart	1	09	16	07	38 S
Lyon's Heart, or Regulus	1	09	55	13	08 N
The Lower of the Pointers	2	10	45	57	42 N
The Upper of the Pointers	2	10	47	63	03 N
Lyon's Tail, Deneb	1	11	37	15	54 N
Upper of the two laſt in □ of the Great Bear	2	12	01	58	23 N
Laſt but two in the Great Bear's Tail	2	12	41	57	18 N
Virgin's Spike	1	13	13	09	54 S
Laſt but one in the Great Bear's Tail	2	13	12	56	13 N
Laſt in the Great Bear's Tail	2	13	35	50	33 N
Arcturus	1	14	05	20	26 N
South Ballance	2	14	38	15	02 S
Foremoſt Guard	2	14	49	75	10 N
Brighteſt of the Crown	2	15	25	27	32 N
Brighteſt in the Serpent's Neck	2	15	32	07	11 N
Antares, the Scorpion's Heart	1	16	15	25	53 S
Head of Hercules	3	17	04	14	40 N
Ophinous, or Serpent's Head	3	17	24	12	45 N
Lyræ, or the Harp	1	18	29	38	34 N
Swan's Bill	3	19	21	27	29 N
Vulture, or Eagle's Heart	2	19	39	08	15 N

Swan's Tail	2	20	33	44	26	N
Mouth of Pegaſus	3	21	32	8	47	N
Fomelhaut	1	22	44	30	53	S
Marchab, or Pegaſus's Wing	2	22	53	13	55	N
Scheat, or Pegaſus's Leg	2	22	48	26	45	N
Cepheus's Knee	3	23	20	76	7	N
Andromeda's Head	2	23	56	27	45	N

The Explanation and Uſe of the Table *of the* Sun's Right-Aſcenſion, *and of the* Table *of the* Star's Right Aſcenſion *and* Declination.

IN the Table of the Sun's Right Aſcenſion, the firſt Page contains the firſt ſix Months of the Year; the next Page the other ſix Months; at the Head of the Table are the Months; in the firſt Column towards the Left-hand are the Days of the Month, and in the oppoſite Column is the Right Aſcenſion in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the firſt towards the Left-hand, are the Names of the Stars; in the ſecond, the Star's Magnitudes; in the third, the Right Aſcenſion in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

Firſt, To find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Aſcenſion of the Sun and Star, and ſubtract the Right Aſcenſion of the Sun from the Right Aſcenſion of the Star, but if the Star's Right Aſcenſion be leſs than the Sun's, add thereto 24 Hours, and then ſubtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, ſubtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppoſe the Time that *Fomelhaut* comes upon the Meridian on the 21ſt of *October* is required.

I find in the Table that Star's Right Aſcenſion to be 22 Hours 44 min. and the Sun's to be 13 Hours 44 min. which ſubtracted from the Star's Right Aſcenſion, leaves 9 Hours 00 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppoſe the Time that the *Bull's Eye* comes upon the Meridian on the 26th of *October* was required.

I find the Star's Right Aſcenſion to be 4 Hours 22 min. the Sun's 14 Hours 3 min. Now becauſe the Sun's Right Aſcenſion is more than the Stars, add to the Star's Right Aſcenſion 24 Hours, which makes 28 Hours 22 min. from which ſubtracting the Sun's Right Aſcenſion 14 Hours 3 min. there remains 14 Hours 19 min. from which ſubtracting 12 Hours, there remains 2 Hours 19 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the ſame Time?

The Rule. To the Sun's Right Aſcenſion, add the Time from Noon, at which the Star's coming to the Meridian is deſired; the Sum is the Right Aſcenſion of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Aſcenſion and Declination, where look what Star's Right Aſcenſion agrees with the Right Aſcenſion before found, or neareſt thereto, and that is the Star ſought for.

Example. Suppoſe *April* the 7th, I deſire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Aſcenſion is 1 Hour 5 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Aſcenſion, makes 9 Hours 5 Minutes; the neareſt in the Table is *Hydra's-Heart*, whoſe Right Aſcenſion is 9 Hours 16 Minutes, and therefore Souths at 8 Hours nearly, and ſo in others.

Directions for obſerving the Stars, to find the Latitude of the Place.

Having before ſhewn how to find the Time of the Star's coming to the Meridian, I ſhall now ſhew, by the Stars Altitude, how to find the Latitude.

Note, In North Latitude, thoſe Stars whoſe North Declination exceed the Complement of that Latitude may be obſerved under the Pole, and the ſame may be performed by the Southern Stars in South Latitude.

Particular Directions for finding the Latitude, by the Meridian Altitude of the fixed Stars.

Rule 1. If the Star comes to the Meridian in the South, and hath North Declination, the Complement of the Meridian Altitude or Zenith Diſtance, (by Obſervation) added to the Declination of the Star, found in the Table of the Star's Right Aſcenſion and Declination, gives the Latitude North.

Example. On the 21ſt of *January*, being at Sea, I find by the foregoing Directions, that the *Lyon's-Heart* comes to the Meridian in the South, at 1 Hour 40 min. after Midnight; the Meridian Altitude by Obſervation was 63 Degrees; which ſubtract from 90 deg. there remains 27 deg. the Complement of the Altitude; to which adding 13 deg. 8 min. the Declination of the Star North, gives 40 deg. 8 min. the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, ſubtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North: But if the Declination exceed the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppoſe on the 21ſt of *July*, being at Sea, the Star *Fomelhaut* cometh to the Meridian in the South, at 2 Hours 41 min. after Midnight, the Merid. Alt. 35 deg. 50 min. the Comp. whereof is 54 deg. 10 min. the Star's Declination is 30 deg. 53 min. South, which ſubtracted from the Complement of the Alt. leaves 23d. 17m. which is the Latitude North.

Example 2. Suppoſe on the firſt of *July*, being at Sea, the *Scorpion*'s *Heart* comes to the Meridian in the South at 9 Hours 34 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 deg. 53 min. South, from which ſubtracting the Complement of the Altitude, there remains 20 deg. 26 min. which is the Latitude, South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, ſubtract the Declination from the Complement of the Altitude, the Remainder is the Latitude South: But if the Declination exceeds the Complement of the Altitude, ſubtract the Complement of the Altitude therefrom, the Remainder is the Latitude, North.

Example 1. On the 22d of *June*, the *brighteſt in the Harp* comes to the Meridian in the North at 25 min. after Midnight, the Complement of the Altitude is 79 deg. from which ſubtracting the Declination, which is 38 deg. 34 min. North, there remains 40 deg. 26 min. which is the Latitude, South.

Example 2. On the 22d of *September*, *Andromeda*'s-*Head* comes to the Meridian in the North at 11 hours 58 minutes at Night, the Complement of the Altitude is 7 deg. 10 min. which ſubtracted from the Declination 27 deg. 45 min. gives 20 deg. 35 min. which is the Latitude, North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude, South.

Example. On the 23d of *December*, *(Syrius, or the Great Dog's Mouth)* comes to the Meridian in the North at 27 Minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 24 min. the Declination South, gives 46 deg. 24 min. the Latitude, South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Stars Declination.

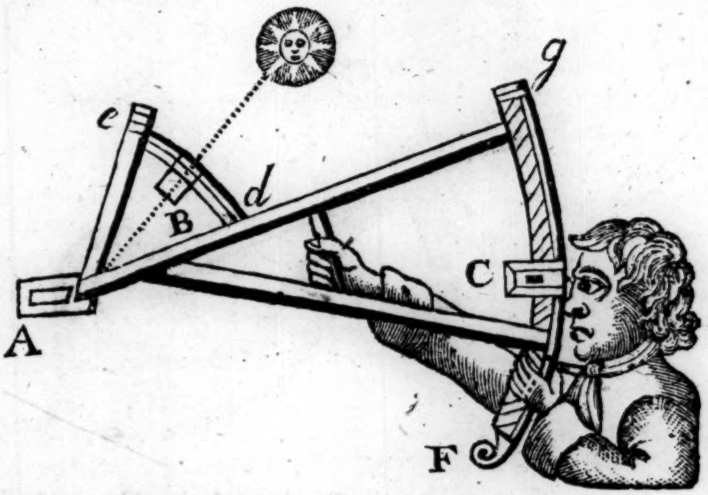
Example. On the 21ſt of *March*, the Pole Star comes to the Meridian under the Pole at 41 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 1 deg. 59 min. which added together, gives 46 deg. 29 min. which is the Latitude, North.

Rule 6. If a Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star has no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Obſerver is to the Northward or Southward of the Star.

The Deſcription and Uſe of the Sea-Quadrant.

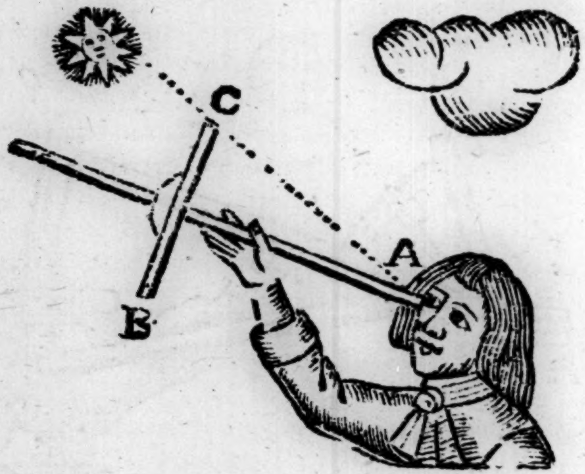
THIS Inſtrument conſiſts of three Vanes and two Arches, the Horizon Vane, which in obſerving, reſpects the Horizon, as at A; the Shade Vane, ſo called, becauſe of its giving the Shadow upon the Horizon Vane, in Time of Obſervation, as at B; beſides this Shade Vane, there is another now in Uſe, having a Convex Glaſs properly fixed therein, which throws a lucid Point upon the Line of Direction in the Horizon Vane, and is of great Service in gloomy Weather, when the Rays of the Sun are too weak to produce a diſtinct Shadow, by the former; (But the only Inſtrument for this Purpoſe, and far ſuperior to any other now in Practice, is HADLEY's Quadrant;) Laſtly, the Sight Vane, which in Time of Obſervation is placed at the Eye, through which the Shadow (or lucid Point) and Horizon are ſeen, as at C. The leſſer of the Arches mark'd with *d e*, is called the Sixty-Arch, becauſe it contains 60 (or more commonly of late 65) Degrees: In Time of Obſervation the Shade Vane is placed upon this Arch always to an even Degree; it is numbered from the upper End at *e*, downwards to *d*, with 5, 10, 15, 20, *&c.* The bigger Arch marked with *g* F, is called the Thirty-Arch, becauſe it contains 30 (or rather 25) Degrees, and is divided into Degrees and Minutes.



The Uſe of this Inſtrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or leſſer Arch) to a Number of Degrees, leſs than the Complement of the Altitude by 15 or 20d. and the Sight Vane upon the Thirty-Arch: The Vanes being thus fixed upon the Quadrant, your Back being turned to the Sun, and the Sight Vane placed to the Eye, look thro' the ſaid Sight Vane, and cauſe the Shadow of the upper Edge of the Shade Vane (or lucid Point in the Glaſs Vane) to fall upon the upper Part of the Slit in the Horizon Vane, where uſually (for Perſpicuity-ſake) there is drawn a black Line or Line of Direction; and if at the ſame Time the Horizon appear tho' the ſaid Slit in the Horizon Vane, you have then the Sun's preſent Altitude, or Zenith Diſtance; but if the Sea appear inſtead of the Horizon, then ſlide the Sight Vane lower towards F; if the Sky appear inſtead of the Horizon, then ſlide the Sight Vane a little higher until the Horizon appear thro' the Horizon Vane: But to obtain the Meridian

Altitude, (which is the greateſt Altitude the Sun will have that Day, and is the Thing uſed to find the Latitude,) continue obſerving, and as the Sun riſes, the Sea will appear through the Horizon Vane; then muſt the Sight Vane be removed lower; And thus continue obſerving, as often as may be convenient till the Sun be at the higheſt, which is the Meridian Altitude: When the Sun begins to fall, the Sky will appear inſtead of the Horizon, and then it's Time to give over obſerving for that Day: Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch, and the Sum is the Complement of the Meridian Altitude; the Uſe of which for finding the Latitude, is ſufficiently ſhewn in the preceding Rules.



Deſcription and Uſe of the Croſs-ſtaff, *or* Fore-ſtaff.

THIS Inſtrument conſiſts of a Staff and four Croſſes, the firſt and ſhorteſt is called the Ten Croſs, and belongs to that Side of the Staff which is numbered from about 3 Degrees to 10 Degrees; Sometimes the Thirty Croſs, and the reſt of the Croſſes are ſo made, as that the Breadth of any of them may ſerve inſtead of this Ten-Croſs.

The ſecond Croſs is called the Thirty-Croſs, and belongs to that Side of the Staff which is numbered from about 10 Degrees to 30.

The Third Croſs is called the Sixty-Croſs, and belongs to that Side of the Staff which is numbered from about 20 to 60 Degrees.

The Fourth and laſt Croſs is called the Ninety-Croſs, and belongs to that Side of the Staff, which is numbered from about 30 to 90 Degrees.

This Staff is likewiſe numbered with the Complement to 90 Degrees, (*viz.*) at 10 ſtands 80, at 20 ſtands 70, at 30 ſtands 60; and ſo of the reſt.

The Uſe of this Inſtrument is to take the Meridian Altitude of the Sun or Star, which is performed as followeth.

Firſt, Conſider how great the Sun's Meridian Altitude will be that Day; and accordingly uſe the Croſs moſt ſuitable, (*viz.*) if the Meridian Altitude be judged to be under 10 deg. uſe the Ten-Croſs; if between 10 and 30, the Thirty-Croſs; if between 30 and 60, the Sixty-Croſs; if between 60, and 90, the Ninety-Croſs, which is ſeldom uſed.

Having put on the Croſs, place the flat or ſquare End of the Staff at A, to the Outſide of the Eye, as near as may be, without hindering the Sight; thus the Face being towards the Sun or Star, hold the Croſs upright; then look at the upper End of the Croſs, at C, for the Sun or Star, and at the lower End at B, for the Horizon, and if the Sea appear inſtead of the Horizon, remove the Croſs a little further from the Eye; but if the Sky appear inſtead of the Horizon, remove the Croſs a little nearer to the Eye, until the Sun or Star appear at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Croſs then in Uſe, will be found the deg. and min. of Altitude of the Sun or Star. But the greateſt Altitude being that which is required, Obſervation muſt be continued as frequently as Judgment ſhall direct, until the Sun or Star be at the higheſt; and as the Sun or Star riſes, the Sky will appear inſtead of the Horizon; but when the Sun or Star is paſt the Meridian, and begins to fall, the Sea will appear inſtead of the Horizon, and then is the Obſervation finiſhed; and upon the Side of the Staff proper to the Croſs uſed, are found the Degrees and Minutes of the Sun's Meridian Altitude; which ſubtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbered with the Complement as ſhewed before) with which to proceed in finding the Latitude of the Place, obſerve the Rules and Directions foregoing.

Of finding the Latitude of a Place by the Altitude of the Pole-Star, taken by Hadley's Quadrant, *or any other convenient Inſtrument, at any Hour of the Night.*

FOR this Purpoſe a Nocturnal hath been generally uſed, but it is now partly by Time, and partly by being founded on bad Principles, become ſo faulty, as to cauſe an Error of near 40 Minutes in the Latitude, in ſome Circumſtances, and therefore cannot be omitted in the preſent improved State of Navigation.

The beſt Method to find the Latitude by an Obſervation of any Star, is to take its Altitude when on the Meridian, and Work by the foregoing Rules.

However, as every Sailor may be ſuppoſed to be acquainted with the North Star, though he may be at a Loſs to know others, I ſhall proceed to give a new Table and Rule, by which the Latitude of the Ship may be found at any Time of the Night, very near the Truth; provided the Horizon can be diſtinguiſhed, which muſt alſo be ſuppoſed in any other Obſervation of the Stars.

The

The TABLE for the NORTH STAR.

Time the Star is diſtant from the neareſt Meridian.		Star above or below the Pole.		Time from the Meridian.		Star above or below the Pole.	
Hours	Minutes	Days	Minutes	Hours	Min.	Days	Min.
0	00	1	56	3	00	1	22
0	15	1	56	3	15	1	17
0	30	1	55	3	30	1	11
0	45	1	54	3	45	1	05
1	00	1	52	4	00	0	58
1	15	1	50	4	15	0	51
1	30	1	47	4	30	0	44
1	45	1	44	4	45	0	37
2	00	1	40	5	00	0	30
2	15	1	36	5	15	0	22
2	30	1	32	5	30	0	15
2	45	1	27	5	45	0	07
3	00	1	22	6	00	0	00

The Uſe of this TABLE *follows.*

The RULE.

HAVING taking the Altitude of the Star, and noted the Time of Obſervation by your Watch, (kept as true cs may be) correct it by Refraction and Dip of the Horizon, as ſhewn in the *Mariner's Compaſs Rectified.* This done, the next Thing is to find the Time of the Stars being on the Meridian above the Pole, by the Rule given in Page 60 of this Calendar: If the Time of Obſervation be not more than 6 Hours diſtant from the Time juſt found; (of the Star being on the Meridian above the Pole) the Diſtance of Time will in the Table give the Degrees and Minutes to be ſubſtracted from the true Altitude of the Star, for the Altitude of the Pole, or Latitude of the Place. But if the Time of Obſervation be more than 6 Hours diſtant from the Meridian; it may be obſerved, that about 12 Hours before the Star is on the Meridian above the Pole, it was, and about 12 Hours after will be again on the Meridian below the Pole. Then enter the Table with the Diſtance of the Time of Obſervation, from the Time of the Stars tranſitting the Meridian below the Pole; and you'll ſee the Degrees and Minutes to be added for the Latitude required.

EXAMPLE.

Suppoſe the Altitude of the North Star was taken at Sea the Third of *December*, at 8 at Night, and found (Refraction and Dip of the Horizon being allowed) to be 52 deg. 10 min. What Latitude was the Ship in?

	Hour	Min.	
The Right Aſcenſion of the Star	0	46	
Add	24	00	
	24	46	
Sun's Right Aſcenſion, ſubtract	16	39	
The Star is on the Meridian above the Pole at	8	7	in the Evening.
Time of Obſervation	8	0	
Time diſtant from the Meridian	0	7	

	Deg.	Min.
Hence from the Altitude of the Star	52	10 N.
Subtract as by the Table	1	56
Remains the Latitude required	50	14 N.

But if the Time of Obſervation had been 4 o'Clock in the Morning, that Time is more than 6 Hours diſtant from the Time of tranſitting the Meridian above the Pole: Therefore we muſt conſider that as it was on the Meridian above the Pole at 8 Hours 7 Minutes at Night, it muſt have been on the Meridian below the Pole about 8 Hours 7 Minutes in the Morning; and therefore ſubtracting the Time of Obſervation 4 Hours, the diſtance of Time from the Meridian below the Pole is 4 Hours 7 Minutes, which in the Table gives 0 Degrees 55 Minutes, which added to 52 Degrees 10 Minutes gives the Latitude 53 Degrees 5 Minutes North.

A TABLE

A Table of the Latitudes and Longitudes of the principal Harbours, Headlands, and Iſlands in the World; Corrected by the lateſt and beſt Obſervations; the Longitude reckoned from the Meridian of LONDON.

Note, *When the Latitude and Longitude of an Iſland is given, the middle of the Iſland is meant, except ſome particular Part of it is expreſſed.*

Places Names.	Latitude North.		Longit. E or W.	
The Coaſt of England.	D.	M.	D.	M.
Berwick	55	48	01	45W
Newcaſtle	55	12	01	30W
Stockton	54	33	01	25W
Spurn	53	45	00	13 E
Yarmouth	52	40	01	38 E
LONDON	51	31	00	00 E
North Foreland	51	25	01	24 E
Beachy	50	46	00	25 E
Dunnoſe Iſle Wight	50	38 North Latitude	01	24
Portland	50	30	02	44
Start Point	50	07	03	47
LIZARD	49	57	05	14
Land's-end	50	06	06	00 Weſt Longitude.
St. Mary Scilly	50	00	06	46
Hartland Point	51	06	04	35
Lundy Iſle	51	20	04	40
Briſtol	51	33	04	35
St. David's Head	51	00	05	22
Barſey or Bardſey Iſle	52	44	05	00
Holy-head	53	24	04	50
Liverpool	53	20	03	00
Whitehaven	54	17	03	30
Carliſle	54	47	03	05
The Coaſt of Scotland.				
Glaſcow	55	52 N	04	05W
N. Part of Sky Iſle	57	45 N	05	45W

Places Names.	Latitude North		Longit. E. or W.	
	D.	M.	D.	M.
North Part of Lewis Iſland	58	20	07	20
St. Kilday	57	52 North Latitude.	09	45 Weſt Longitude
Farro Head	58	34	05	10
Northern Iſles of Orkney	59	10	03	22
Shetland S. Point	60	04	02	00
Buchaneſs	57	45	01	18
Aberdeen	57	22	01	40
Dundee	56	28	02	40
Edenburgh	55	58	02	59
The Coaſt of Ireland.				
Dublin	53	12	06	56
Wexford	52	13 North Latitude	07	27 Weſt Longitude
Waterford	52	09	08	40
Cork	51	49	09	30
Cape Clear	51	17	11	10
Limrick	52	23	09	35
Galway	53	07	09	40
Sline Head	53	20	11	15
Londonderry	55	00	07	50
Bellfaſt	54	39	06	30
The Coaſt of Holland and Flanders.				
Scaw	57	30 N	10	20E
Helighland	54	24 N	08	35 E Ham.

Places Names.	Latitude North			Longit. E. or W.		
	D.	M		D.	M	
Hambrough	53	41		10	35	
Emden	53	05	North Latitude	07	35	East Longitude.
The Fly	53	15		05	30	
The Texel	53	15		05	10	
Amſterdam	52	23		05	04	
Rotterdam	51	55		04	30	
The Brill	52	00		04	00	
Sluys	51	14		03	43	
Calais	50	58		01	54	
The Coaſt of France and Portugal.						
Dieppe	49	56		01	09E	
Cape de Hogue	49	47		02	00	
Caskets	49	50		02	20	
Guernſey	49	33		02	40	
St. Maloes	48	39		01	57	
Morlaix	48	33		03	49	
Uſhant	48	30		05	02	
Breſt	48	23		04	25	
Penmark	47	48	North Latitude.	04	24	Weſt Longitude.
Bell Iſle	47	18		03	16	
Nantz	47	14		01	39	
Iſland Dieu	46	34		02	13	
Iſland Ree	46	10		01	30	
Rochel	46	10		01	11	
Bourdeaux	44	50		00	38	
Bilboa	43	29		02	58	
Cape Ortegal	44	04		07	48	
Cape Finiſter	43	12		09	40	
Port a Port	41	10		09	25	
Burlings	39	35		09	24	
Rock of Lisbon	38	52		09	50	
Lisbon	38	42		08	53	
Cape *St*. Vincent	36	53		09	06	
Cadiz	36	33		06	01	
Cape Trefalgar	36	10		06	01	
The Coaſt on the Main Continent within the Straits						
Gibraltar	36	12N		04	53W	
Cape de Gat	36	40N		01	40W	

Places Names.	Latitude North			Longit. E. or W.		
	D.	M.		D.	M.	
Cape Paul	38	13		0	c05	
Cape St. Martin	38	46		00	40	
Barcelona	41	26		02	18	
Marſeilles	43	18		05	27	
Toulon	43	07		06	02	
Genoa	44	25		08	43	
Leghorn	43	28		10	35	
Rome	41	54		12	45	
Naples	40	51		14	46	
Cape Spartavento	37	55		16	55	
Cape Collonne	38	56		18	05	
Gallipoli	39	56		18	43	
Cape *St*. Mary	39	45		19	00	
Ancona	43	40		14	26	
Venice	45	25		12	10	
Lepanto	38	10		22	52	
Cape Matapan	36	33	North Latitude.	22	41	Eaſt Longitude.
Cape *St*. Angelo	36	32		23	56	
Athens	37	58		24	05	
Cape Martelo S. P. of Negropont	38	07		25	03	
Cape Monte Sancto	40	26		25	02	
Salonica	40	41		23	13	
Gallipoli	40	33		27	20	
Conſtantinople	40	59		28	56	
Smyrna	38	28		27	25	
Epheſus	38	01		27	53	
Antiochetta	36	30		32	46	
Scandaroon	36	34		36	30	
Aleppo	35	42		37	24	
Tripoli	34	38		36	15	
Alexandria	31	10		30	19	
Cape Ruſato	32	48		21	25	
Cape Meſurato	32	21		16	17	
Tripoly	32	54		13	10	
Cape Bona	37	03		11	04	
Bona	36	52		08	19	
Algier	36	50		03	16	
Cape de tres forcas	35	30		02	04W	
Tetuan	35	27		05	06W	
Ceuta	35	54		04	45W	
Tangier	35	42		05	22W	

Aboran

Places Names.	Latitude North		Longit E. or W.	
Iſlands within the Straits.	D.	M.	D.	M.
	North Latitude		East Longitude	
Alboran	35	54	02	29W
Formentura	38	33	01	55
Yvica	38	50	01	40
Majorca	39	30	03	03
Minorca City	39	51	04	52
PortMahonMinorca	39	42	04	12
Gallitta	37	41	08	44
Sardinia South End	38	46	09	12
Corſica North End	42	56	09	50
Gorgona	43	34	09	38
Captia	43	03	10	17
Lilboa, or Elba	42	45	11	00
Meſſina	38	07	16	20
Maritimo	38	12	17	09
Cape Paſſaro	36	38	15	40
Malta	35	53	14	32
Corfu	39	42	20	06
Chephalonia	38	15	21	00
Zante	37	46	21	14
Modon or Morea	36	52	21	32
Lemnos	39	59	25	37
Scio	38	22	26	12
Liſſa	43	06	16	40
C. St. John Weſt end of Candy	35	15	24	00
Cape Solomon, E end of Candy	35	00	27	08
Rhodes City	36	42	28	05
Weſt end of Cyprus	34	57	32	23
Eaſt-end of Cyprus	35	31	35	00
The Coaſt of Barbary and Guiney.				
	North Latitude		Weſt Longitude	
Cape Spartel	35	50	05	49
Sallee	33	51	06	25
Cape Cantin	32	36	09	10
Cape de Geer	30	27	10	06
Cape Bajadore	26	04	15	35
Cape Olerado	23	41	15	50
Cape Blanco	20	32	17	35
Senegall	15	28	16	25

Places Names	Latitude N. or S		Longit. E. or W	
	D.	M.	D.	M
	North Latitude		Weſt Longitude	
Cape de Verde	14	43	17	20
River Gambia	13	08	15	31
Sierraleona	08	36	12	57
Mezſurado	06	05	10	02
Cape Palmas	04	13	06	45
Jaque Jaque	04	16	09	47
Aſſene	04	15	07	17
Cape 3 Points	04	28	01	50
			Eaſt Longitude.	
River Volta	05	55	03	25
River Formoſa	07	00	07	20
Cape Formoſa	04	15	06	40
New Calabar	04	42	08	33
Old Calabar	04	10	09	45
River Camerones	03	25	10	10
River de Angra	00	50	10	01
	South Latitude.			
C. Lopas	00	55	09	55
River Congo	05	40	15	25
Angola	08	57	15	56
Cape Negro	16	08	12	31
Cape St. Thomas	24	10	14	43
Secos	29	00	15	56
C. Bona Eſperance	34	07	19	35
Weſtern Iſlands.				
	North Latitude		Weſt Longitude.	
Corvo	39	54	30	55
Flores	39	32	30	54
Fyal	38	53	28	15
Pico	38	40	27	20
St. George	38	52	26	03
Tercera	38	57	25	34
St. Michael	38	06	23	36
St. Maries	36	59	23	38
The Canary Iſlands.				
	North Latitude.		Weſt Longitude.	
Ferro	27	54	17	45
Palma	28	40	17	36
Gomero	28	06	17	05
Teneriff	28	23	16	28
Madeira Weſt end	32	44	17	26
Porto Sancto	33	12	15	54
Canaria	27	52	15	10
Forteventura SW.	28	05	13	36
Lancerota	29	02	12	45

Cape

Places Names.	Latitude N. or S.		Longit. E. or W	
Cape de Verde Iſlands.	D.	M.	D.	M.
St. Antonio	17	35	24	40
St. Vincent	17	15	24	25
St. Lucia	17	07	24	20
St. Nicholas	17	00	23	38
Brava's	14	28	23	54
Fuego	14	50	23	35
St. Jago	15	08	22	45
Iſle of May	15	14	22	08
Iſle of Sal	16	50	22	08
Bonaviſta	16	05	22	08

North Latitude. Weſt Longitude.

Southern Iſlands.

St. Matthew's	01	30 S	06	01 W
Aſcenſion	07	40 S	14	05 W
St. Helena	16	00 S	06	04 W
Fernande Poo	02	40 N	10	30 E
Princeps	01	40 N	09	15 E
St. Thomas	00	00	08	20 E
Annabona	02	10 S	07	27 E

The Coaſt on the Main Continent in the Eaſt-Indies.

Cape Lagullas	34	54 S	21	20
Cape Bon Eſperance	34	07 S	19	35
Cape Corientes	23	40 S	36	17
Moſambique	15	04 S	41	10
River de Fuegos	00	41 S	41	15
Cape Baſſos	04	06	47	38
Cape Guardefoy	11	44	51	20
Cape Raſulgat	22	41	59	45
C. Muca or Muſcat	23	32	59	45
Buſero	29	45	49	20
Surat	21	10	72	25
Goa	15	31	73	50
Callecut	11	16	75	30
Cochin	09	54	75	55
Cape Comerine	07	50	77	25
Fort St. George	13	11	80	32

North Latitude. Eaſt Longitude

Places Names.	Latitude N. or S.		Longit. Eaſt	
	D.	M.	D.	M.
Diu Point	16	08	81	32
Viſagapatam	17	43	83	57
Cape Palmiras	20	42	87	52
Ballaſore Road	21	16	87	48
Bengal	22	17	92	21
Cape Negrais	26	23	93	00
Malacca	02	12	102	10
Siam Entrance	14	18	100	55
Cambodia Entrance	10	28	105	00
Cochin	14	05	107	56
Macao	22	13	113	51
Canton	23	14	113	06
Amoy or Quemoy	24	35	116	50
Laimpo	29	59	120	35
Nanquin	33	07	120	01

North Latitude. Eaſt Longitude

Iſlands in the Eaſt-Indies.

Madagaſcar S.end	25	47	46	10
St Laurence Nend	12	10	51	05
Mayetta	13	10	45	38
Mohilla	12	05	44	23
Comero	11	40	43	50
Juan de Nova	09	30	52	40
Mauritius	20	10	52	55
Diego Royes	19	50	61	30
Romeras de Caſtela-	28	45	67	17
Amſterdam [mas	38	40	72	45
St. Brandon	16	38	64	30
Diego Gratioſa	08	40	68	25
Quabella	03	53	52	36
Baſſas de Chagos	06	55	68	45
Yas de Diego Reys	00	20	72	00
Maldivia Nend	07	14	73	04
S. end	00	25	76	22
Malique	09	00	72	58
Sacatra	12	21	54	05
Abdeleur	12	04	53	04
C. Gallode Zeylone	06	08	81	15

South Latitude. N. Latitude Eaſt Longitden.

Yas

Places Names.	Latitude N. or S D.	M		Longit. E. or W D	M.	
Yas de Amber	00	00	N. Latitude	52	30	East Longitude.
Andaman	11	10		73	19	
Nicobar	07	11		93	40	
Sumatra NW. End	05	22		94	50	
Verkin's Iſland	02	22		94	07	
Naſſau Iſland	02	54	South Latitude.	99	32	
Bencola	03	55		104	08	
Sumatra SE. End	05	22		105	10	
Engano or Trompeus	05	50		101	43	
Selam	08	20		102	13	
Princes Iſland	06	30		104	02	
Bantam in Java	06	11		105	55	
Batavia	06	16		106	46	
Java Eaſt End	08	32		113	30	
Straits of Sundy	06	02		105	46	
Banca South End	03	20		106	45	
Borneo South Point	03	54		113	37	
Banda Iſles	04	55		127	17	
Celebes { South end	05	10		119	07	
N. end	01	40	North Latitude.	121	20	
Mindano Weſt point	06	40		119	15	
Borneo North Point	07	40		113	05	
Luconia { SW. poi.	12	30		120	10	
NE. poi.	18	55		120	05	
Anian { NW point	19	30		107	00	
NE. point	19	55		109	55	
Formoſa { S point	22	00		119	56	
N. point	25	30		120	45	
Piſcadore Iſles	23	30		118	35	
Iſland Chuſan	30	38		120	35	
Japan { S.E. point	35	30		140	30	
S. W point	35	00		128	30	

The Coaſt of America in the South Sea, from California to Cape Horn.

Places Names.	D.	M.		D.	M.	
Cape St. Sebaſtian	42	45	North Latitud	127	55	Weſt Longitude
Cape S Lucas or Lucar	23	20		111	46	
Cape Corientes	18	50		110	30	
Aquapulco	17	05		104	18	
Aquatulco	15	27		102	03	
Guatimala	14	25		101	00	
Panama	08	50		81	52	

Places Names.	Latitude N or S. D.	M.		Longit Weſt D.	M.	
Bay Bonaventuro	03	24	N	78	06	Weſt Longitude.
Iſland Gallopega	00	00		90	10	
Cape del Ajuga	06	30	South Latitude	84	50	
Lima	12	15		77	30	
Arica	18	29		73	10	
La Serena	29	00		76	22	
I. Juan Fernandes	33	15		83	18	
Baldivia	39	35		81	10	
Port Steven	46	50		82	36	
Cape Victory	52	00		83	10	
Cape Horn	56	35		79	55	

The Coaſt of Brazile in South America, from Cape Horn to Cape Roque.

Places Names.	D.	M.		D.	M.	
Magellan E. entran.	52	00	South Latitude.	75	05	Weſt Longitude.
River Julian	48	40		74	34	
Cape Blanco near R. Camarones	46	50		72	07	
Buenos Aires R. Plata	34	35		57	54	
River Grand	31	55		52	00	
St. Catherine's	27	50		49	00	
Cape Frio	23	00		42	20	
Spirito Sancto	19	59		42	10	
P. Segura	16	31		40	35	
Bay Todos Sanctos	12	46		41	00	
R. St. Franciſco	10	50		37	50	
Olinda or Pernambuco	07	48		35	30	
Cape St. Auguſtine	08	35		35	20	
Cape Roque	05	00		35	47	
Triſtian D' Acunha	37	05		13	50	
Trinidada	20	30		30	00	

The Coaſt of the Main Continent in the Weſt-Indies.

Places Names.	D.	M.		D.	M.	
R. Amazones Entr.	00	00	North Latitude.	49	56	Weſt Longitude
North Cape	02	05		49	56	
Suranam	06	25		56	50	
Oronoque	08	15		59	25	
C. Conquibaca	12	40		70	42	
Carthagena	10	28		75	21	
Scot's Settlement	08	30		78	45	
Nicaragua Entrance	11	25		84	15	
Cape Catocha	21	20		86	01	

Places Names.	Latitude North		Longit. Weſt.	
	D.	M.	D.	M.
Campecha	19	30 N	92	10 W
La Vera Cruz	19	12 N	97	48 W
Mexico	20	00 N	103	35 W
Eſcondido	30	20 N	89	30 W
Cape Florida	24	57 N	80	30 W

The Caribbee Iſlands.

Places Names.	D.	M.	D.	M.
Trinidada	10	15	60	17
Tobago W. End	11	10	59	10
Granado	11	57	60	20
Barbadoes	22	58	58	50
St. Vincent	13	12	60	12
St. Lucia	13	55	60	04
Martinico	14	43	60	54
Dominico	15	23	60	30
Marigallante	15	58	60	20
Guardalupa	16	10	61	15
Monſerat	16	45	62	15
Antegua	17	05	61	45
Nevis	17	05	62	32
St. Chriſtopher's	17	17	62	40
Barbuda	17	56	60	40
St. Bartholomew	17	52	62	06
St. Martin's	18	06	62	10
Anguilla	18	17	62	13
Virgin's	18	30	63	25
St. Cruize	17	52	63	30
Bieque	18	00	63	15
Porto Rico St John's	18	30	65	37
St Domirgo Hiſpan.	18	25	69	30
P. Royal Jamaica	17	40	76	32
Eaſt End of Cuba	20	15	73	55
Havanna	22	40	82	55
Bay Hondy	22	45	83	40
Cape St Antonio	21	45	85	32

North Latitude. Weſt Longitude.

Bahama Iſlands.

Places Names.	D.	M.	D.	M.
Bermudas	32	25 N	63	40 W
N. Point Bahama Bank	27	50 N	78	35 W

Places Names.	Latitude North		Longit. Weſt	
	D.	M.	D.	M
Bahama Iſland	26	50	79	36
Abaco S. Point	26	00	73	46
Harbour Iſland	25	37	76	47
Androſs N. Point	25	10	78	50
Providence	25	00	77	20
Eleuthera S. point	24	40	75	56
Cat Iſland	24	25	75	09
Watling's Iſland	24	03	74	35
Rum Key	23	45	74	50
Exuma	23	22	75	55
Crooked Iſle N. point	22	56	74	12
Atkin's Key	22	17	74	05
Meraparvouz	21	58	74	45
Atwood Keys	23	10	73	35
French Keys	22	40	73	40
Mayaguana	22	35	72	46
Hogſties	21	17	73	55
Hyneago W. End	20	52	73	46
Caicos Bank N. point	20	50	71	15
Turk's Iſland	21	35	70	08
Abrolho N. point	21	35	69	06
Platewrack	20	10	68	15

North Latitude. Weſt Longitude

The Coaſt of Carolina, Virginia, Maryland, Penſylvania, New-England, and New-foundland

Places Names.	D.	M.	D.	M.
Charles Town upon Aſhly River	32	45	78	46
Cape Hatteras	35	15	74	20
Cape Henry	37	00	75	24
Cape Charles	37	16	74	16
Cape Hinlopen	38	50	74	56
Long Iſland	40	50	72	45
New York	40	58	73	53

North Latitude Weſt Longitde

Cape

Places Names	Latitude North D.	M.	Longit. West D.	M.
Cape Cod	42	12	68	55
Boſton Entrance	42	30	69	23
Cape Sable	43	50	64	58
Iſland Sable	44	20	59	01
Cape Britain	46	00	58	30
Quebeck	46	55	69	48
Bay of Breſt	52	10	56	57
Bell Iſland	52	07	55	35
Cape St. John	50	25	52	48
Cape Bonaviſta	49	15	52	12
Trinity Bay Entr.	48	52	52	20
Conception Bay En.	48	20	52	08
St. John's Harbour	48	00	51	39
Bay of Bulls	47	50	51	29
Cape Race	46	40	51	52
Cape St. Mary	47	10	53	23
Placentia Bay	47	45	53	58
Cape Roy	48	00	57	40

The Coaſt of Hudſon's-Bay and the Straits.

Buttons Iſles	60	25	66	27
Cape Charles	62	10	75	35
Cape Walſingham	62	35	77	55
Mansfield Iſle	61	42	80	30
Cape Jones	54	55	78	58
Rupert's River	51	30	79	26
Albany Fort	52	26	84	50
The Cubb's	54	10	82	40
C. Henrietta Maria	55	07	84	30
Port Nelſon	57	10	93	58
Cape Churchil	59	00	95	20
C. Southampton	61	55	86	48
Shark Point	64	30	82	55
Nottingham Iſle	63	30	79	53
Q. Ann's Foreland	63	48	74	45
Reſolution Iſle	61	50	65	04
Cape Farewell	59	45	46	45

The Coaſt of Iceland, Greenland, Nova Zembla, and the Northern Iſles.

Places Names.	Latitude North D.	M	Longit. E or W. D.	M
Sound Royal	66	22	24	33
Bargarer's Point	66	20	16	35
Whales Back	65	27	20	33
Merchants Foreland	63	25	17	05
Halliford	64	30	34	43
Fair Foreland	66	20	26	27
Grim's Iſland	67	15	22	34
Weſtmania Iſles	63	30	22	54
Iſles of Fero	62	06	05	00
Beerenberg, or John Main's Iſle	71	45	04	30
Point Lookout	76	25	15	36
Horn Sound	76	45	13	36
Fair Foreland	79	20	10	52
Hacluit's Headland	79	55	11	00
Helie's Sound	78	55	21	50
Lee's Foreland	78	05	23	25
Whale's Head	77	18	21	30
Hope Iſland	76	18	23	45
Cherry or Bear Iſle	74	30	18	08
Admiralty Iſland	75	05	55	50
Fretum Borough	70	00	61	20
Cape Candenoſe	69	05	42	35
Catnoſe	65	43	35	14
Archangel	64	30	40	30
Croſs Iſland	66	31	36	33
Sweetnoſe	68	10	34	45
Kilduyn	69	30	31	20
North Cape	71	23	23	02
Surroy Iſle	71	05	16	40
Tromſound	70	25	15	30
Loefort SW. Point	68	15	09	40
Dronten	63	40	10	15
Stadland	62	10	04	38
North-bergen	60	10	05	40
Naze of Norway	57	45	07	24

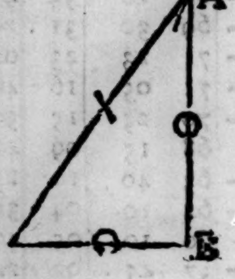
Places Names.	Latitude North.		Longit. Eaſt.		Places Names.	Latitude North.		Longit. Eaſt.	
Sea-Coaſt in the Sound, & Baltic Sea.	D.	M.	D.	M.		D.	M.	D.	M.
	North Latitude.		Eaſt Longitude.			North Latitude.		Eaſt Longitude.	
Maerden, or Mardel	58	19	08	57	Narva	59	27	28	25
Larwic	58	54	09	20	Revel	59	27	24	51
Chriſtiana	59	40	10	00	Riga	57	04	25	15
Maeſterland	57	53	11	45	Derwinda	57	15	22	06
Gottenberg Gat	57	50	12	15	Coningsburg	54	43	21	35
Elſenore	56	22	12	42	Dantzic	54	22	18	36
Roſtock	54	37	18	40	Wisby in Gotland	57	30	18	30
Copenhagen	55	41	12	50	Bornholm	55	15	14	45
Valſterborn	55	28	13	00	Straelſund	54	25	13	16
Uraniburg	55	54	12	58	Lubec	54	06	09	55
Calmer	56	40	16	35	Anout, or Anholt	56	50	11	06
Stockholm	59	20	19	30	Leſou, or Leſnou	57	05	10	30
Wyburg	60	52	29	16	Scaw	57	30	10	20
Petersburg	60	00	30	25					

Problems of Plane Sailing, wrought by Logarithms, *and by* Gunter's-Scale.

PROBLEM I.

THE Courſe and Diſtance being given; to find the Difference of Latitude and Departure.

Example. Suppoſe a Ship ſails South Weſt by South 382 Minutes, and the Difference of Latitude and Departure are required.



In the Right-angled Triangle ABC.
AC repreſents the Diſtance ſailed.
AB the Difference of Latitude.
BC the Departure.
BAC (or the Angle at A) the Angle of the Courſe.
ACB (or the Angle at C) the Complement of the Courſe to 90 deg.

Characters uſed in Navigation *and* Aſtronomy.

S. ſtands for Sine.
T. for Tangent.
S.c. Sine Complement. T. c. Tangent Complement.
The given Sides and Angles of a Triangle are marke with a daſh (′).
The required Sides and Angles with a Cypher thus (°.)

The Operation by Logarithms. *For the Difference of Latitude.*

As Radius ——— ——— ——— ——— ——— 10.000000
To the Diſtance ſailed 382 Minutes ——— ——— ——— 2.582063
So is the S.c. of the Courſe 56d. 15m. ——— ——— 9.919846
To the Difference of Latitude 317.6 Minutes ——— ——— ~~1~~2.501909

For the Departure.

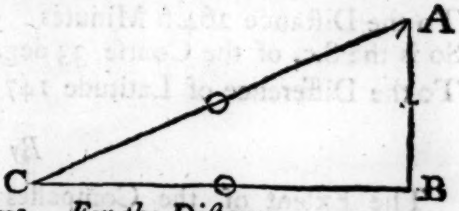
As Radius ——— ——— ——— ——— ——— ——— 10.000000
To the Diſtance ſailed 382 Minutes ——— ——— ——— 2.582063
So is the S. of the Courſe 33d. 45m. ——— ——— ——— 9.744739
To the Departure 212.2 Minutes ——— ——— ——— ~~1~~2.326802

The Operation by Gunter's Scale.

One Foot of the Compaſſes being in the Radius, or S. of 8 Points; extend the other to the Diſtance 382 Minutes, the ſaid Extent laid from S. Courſe 3 Points will reach to 212.2 Minutes, the Departure from the Meridian, and the Compaſſes kept at the ſame Diſtance will reach from the S.c. Courſe 5 Points to 317.6 Minutes, the Difference of Latitnde as above.

PROB. II. The Courſe and Difference of Latitude given, to find the Diſtance and Departure.

Suppoſe a Ship ſails WSW until the Difference of Latitude be 219 Leagues, and the Diſtance and Departure required.



The Operation by Logarithms. *For the Diſtance.*

As the S.c. of the Courſe 22d. 30m. ——— ——— ——— 9.582840
To the Difference of Latitude 219 Leagues ——— ——— 2.340444
So is Radius ——— ——— ——— ——— ——— ——— 10.000000
To the Diſtance, which is 572.2 Leagues ——— ——— 2.757604

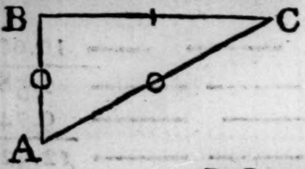
For the Departure.

As Radius ——— ——— ——— ——— ——— 10.000000
To the Diſtance 572.2 Leagues found before ——— ——— 2.757548
So is the Sine of the Courſe 67 deg. 30 min. ——— ——— 9.965615
To the Departure 528.6 Leagues ——— ——— ——— $\cancel{1}2.723163$

By Gunter.

The Compaſſes being extended from the S. of 2 Points, the Complement of the Courſe to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to 572.2 Leagues, the Diſtance, and the ſame Extent of the Compaſſes from the Sine of the Courſe 6 Points, will reach to 528.6 Leagues, the Departure.

P R O B. III. The Courſe and Departure given, to find the Diſtance and Difference of Latitude.



Suppoſe a Ship ſails North Eaſt by Eaſt, and her Departure be 220 Minutes, the Diſtance and Difference of Latitude required.

By Logarithms. *For the Diſtance.*

As the S. of the Courſe 56 deg. 15 min. ——— ——— 9.919846
To the Departure 220 Minutes ——— ——— ——— ——— 2.342423
So is Radius ——— ——— ——— ——— ——— 10.000000
To the Diſtance 264.6 Minutes ——— ——— ——— 2.422577

For the Difference of Latitude.

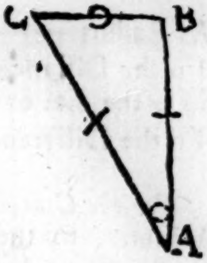
As Radius ——— ——— ——— ——— ——— ——— 10.000000
To the Diſtance 264.6 Minutes ——— ——— ——— 2.422590
So is the S.c. of the Courſe 33 deg. 45 min. ——— ——— 9.744739
To the Difference of Latitude 147 Minutes ——— ——— $\cancel{1}2.167329$

By Gunter.

The Extent of the Compaſſes from the S. of the Courſe 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 264.6 the Diſtance; and the ſame Extent of the Compaſſes from S. 3 Points the Complement of the Courſe, will reach to the Difference of Latitude 147 Minutes, as above.

P R O B. IV. The Diſtance and Difference of Latitude given, to find the Courſe and Departure.

Suppoſe a Ship ſails between the North and the Weſt 206 Miles, until the Difference of Latitude be 197 Miles, the Courſe and Departure required.



By Logarithms. *For the Courſe.*

As the Diſtance 206 Miles ——— ——— ——— — 2.313867
To the Radius ——— ——— ——— ——— 10.000000
So is the Difference of Latitude 197 Miles ——— ——— 2.294466
To the S.c. of the Courſe; which is N. 17d. 00m. Weſt.—— 9.980599

For the Departure.

As the Radius ——— ——— ——— ——— ——— 10.000000
To the Diſtance 206 Miles ——— ——— ——— — 2.313867
So is the S. of the Courſe 17 deg. 00 min. ——— ——— — 9.465935
To the Departure 60.23 Miles ——— ——— ——— — 11.779802

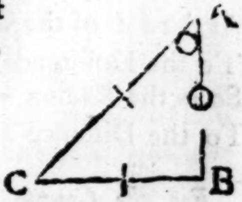
By Gunter.

For the Courſe. The Extent from the Diſtance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Courſe, which ſubtracted from 90d. is 17d. 00m. the Courſe N. Weſterly, or N. by W. half W.

For the Departure. The Extent from Radius S. 90d. to the Sine of the Courſe 17 deg. 00 min. will reach from the Diſtance 206 Minutes, to the Deparure 60.23 Minutes, as above.

PROB. V. The Diſtance and Departure given, to find the Courſe and Difference of Latitude.

Suppoſe a Ship ſails between the South and the Weſt 247 Minutes, until the Departure be 197 Minutes, required the Courſe and Difference of Latitude.



The Operation by Logarithms. *For the Courſe.*

As the Diſtance 247 Minutes ——— ——— ——— 2.392697
To the Radius ——— ——— ——— ——— ——— 10.000000
So is the Departure 197 Minutes ——— ——— ——— — 2.294466
To the Sine of the Courſe S. 52 deg. 54 min. Weſterly —— 9.90176

Fo

For the Difference of Latitude.

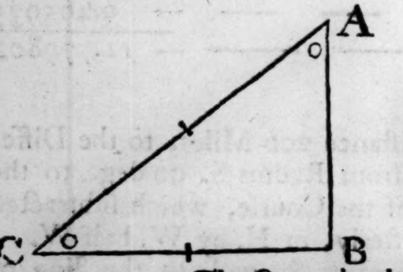
As Radius — — — — — — 10.000000
To the Diſtance 247. Minutes — — — 2.392697
So is the S.c. of the Courſe 37 deg. 6 min. — — — 9.780467
To the Difference of Latitude 149 min. — — — 12.173164

By Gunter.

For the Courſe. The Extent of the Compaſſes from the Diſtance 247 Minutes, to the Departure 197 Minutes, will reach the ſame way from Radius S. 90 deg. to the Sine of the Courſe 52 deg. 54 min. South Weſterly, or South Weſt three quarters Weſt.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to S. 37 deg. 6 min. the Complement of the Courſe, will reach the ſame way from the Diſtance 247 min. to the Difference of Latitude 149 min.

PROB. VI. The Difference of Latitude and Depature given, to find the Courſe and Diſtance.



Suppoſe a Ship ſails between the South and the Weſt, until the Difference of Latitude be 154 Leagues, and her Departure 200 Leagues; required the Courſe and Diſtance.

The Operation by Logarithms. *For the Courſe.*

As the Difference of Latitude 154 Leagues — — 2.187521
To Radius — — — — — — — 10.000000
So is the Departure 200 Leagues — — — 2.301030
To the Tangent of the Courſe 52d. 24m. South W.erly — 10.113509

For the Diſtance.

As the S.c. of the Courſe 37 deg. 36 min. — — 9.785433
To the Difference of Latitude 154 Leagues — — 2.187521
So is the Radius — — — — — 10.000000
To the Diſtance 252.5 Leagues — — — — 2.402088

By Gunter.

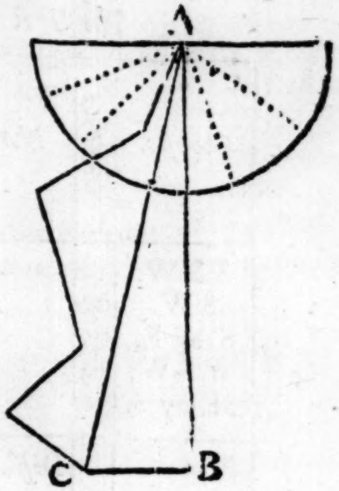
For the Courſe. The Extent of the Compaſſes from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, will reach from Radius or Tangent of 45 deg. to the Tangent of the Courſe, 52 deg. 24 min. South Weſterly, or South Weſt three quarters Weſt.

For the Diſtance. The Extent from the S. 37 deg. 36 min. the Complement of the Courſe, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Diſtance 252.5 Leagues.

PROB

PROB. VII.

This Problem ſhews the manner of working a Traverſe; and is very uſeful in keeping a Reckoning by Plane Sailing.



Example.

Suppoſe a Ship bound to a certain Port, and ſails firſt SSW. 40 minutes, then SW. 60 min. then S. by E. 63 min. then WSW. 49 min. then S. E. by S. 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Courſe and Diſtance is required.

The Operation by Logarithms.

For the Difference of Latitude for the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the S.c. of the Courſe 67d. 30m.	9.965615
To the Difference of Latitude 36.95 min.	~~1~~1.567675

For the Departure of the firſt Courſe.

As Radius	10.000000
To the Diſtance 40 min.	1.602060
So is the S. of the Courſe 22d. 30m.	9.582840
To the Departure 15.31 min.	~~1~~1.184900

By Gunter.

The Extent of the Compaſſes from Radius the S. of 8 Points, to the Diſtance 40 min. that Extent in the Compaſſes laid from the Sine of the Courſe 2 Points, will reach to 15.3 min. the Departure, and the Compaſſes being kept to the ſame Extent, and laid from the S. 6 Points, the Complement of the Courſe, will reach to 36.9 min. the Difference of Latitude.

In the ſame manner proceed to find the Difference of Latitude and Departure for each Courſe and Diſtance; which being found, place in a Table as follows.

the

The TRAVERSE-TABLE.

Courſes.	*Diſtance.*	*North.*	*South.*	*Eaſt.*	*Weſt.*
S S W.	40		37.0		15.3
S W.	60		42.4		42.4
S by E.	63		61.8	12.3	
W S W.	49		18.8		45.3
SE by S.	56		46.6	31.1	
		Diff. Lat.	206.6	43.4	103.0 43.4
				Dep.	59.6

The Explanation of the TABLE.

In placing the Difference of Latitude and Departure in their proper Columns, obſerve, that if the Courſe be Northerly, the Difference of Latitude is put in the North Column; if it be Southerly, in the South Column; and if the Courſe be Eaſterly, the Departure is put in the Eaſt Column; if Weſterly, in the Weſt Column.

Thus having framed the Table, add up the North, South, Eaſt, and Weſt Columns ſeverally, whereby the Difference of Latitude appears to be 206.6 Minutes South, becauſe there is nothing in the North Column; The Departure 59.6 Minutes Weſt, becauſe by ſo much the Weſt Column exceeds the Eaſt; then by this Difference of Latitude and Departure, find the direct Courſe and Diſtance as follows.

The Operation by the Logarithms. *For the direct Courſe.*

As the Difference of Latitude 206.6 min.	2.315130
To the Radius	10.000000
So is the Departure 59.6 min.	1.775246
To the T. of the Courſe 16d. 5m. South Weſterly, becauſe the South and Weſt Columns exceeds the North and Eaſt	9.460116

For the Diſtance.

As the S.c. of the Courſe 16d. 5m.	9.982660
To the Difference of Latitude 206.6 min.	2.315130
So is Radius	10.000000
To the Diſtance required 215 min.	2.332470

By Gunter. *For the direct Courſe.*

The Extent of the Compaſſes from the Difference of Latitude 206.6m. to the Departure 59.6m. will reach from the Tangent of 45d. (or Radius) to the Tangent of 16d. 5m. the Courſe required.

For the Diſtance.

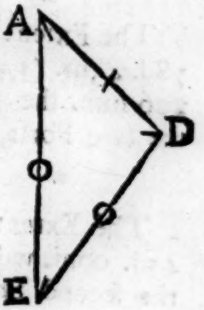
The Extent from S. 73 deg. 55 min. the Complement of the Courſe, to S. 90 deg. *viz.* Radius will reach from the Difference of Latitude 206.6m. to the Diſtance 215 Minutes.

Oblique-angled Plane Triangles, applied in PROBLEMS *of* Plane-Sailing, *and wrought by* Logarithms, *and* Gunter's-Scale.

PROB. I. THE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppoſe there are two Ports both under one Meridian, a Ship ſails from the Northermoſt SE. 206 Miles, another Ship ſails from the Southermoſt North Eaſt by North, a certain Number of Miles, and meets with the firſt Ship; the Diſtance between theſe two Ports, and the Diſtance ſailed by the ſecond Ship is required.



In the Triangle ADE.

A and E repreſents the two Ports. AD the firſt Ship's Diſtance. E D the ſecond Ship's Diſtance. A E the Diſtance between the two Ports.

The Operation by Logarithms. *For the Diſtance between the two Ports.*

As S. AED 33d. 45m.	Co. Ar.	0.255261
To AD the firſt Ship's Diſtance 206 min.		2.313867
So is S. ADE 101d. 15m. which ſubtracted from 180d.		9.991574
To AE, the Diſtance between the two Ports 363.7m.		~~1~~2.560702

In all Proportions where Radius is not one of the three given Terms, to ſave the Labour of ſubtracting the firſt Logarithm from the Sum of the ſecond and third, uſe the Complement Arithmetical of the firſt Logarithm, which is found by ſubtracting each Figure of the Logarithm from 9, except the firſt towards the Right-hand, which is ſubtracted from 10, as in the Operation, the Logarithmic Sine found in the Table is 9.744739, wherefore beginning at the Left-hand, ſay 9 from 9 there remains 0; 7 from 9 there remains 2; 4 from 9 there remains 5; 4 from 9 there remains 5; 7 from 9 there remains 2; 3 from 9 there remains 6; 9 from 10 there remains 1; So the Complement Arithmetical of the firſt Logarithm, is 0.255261, which added to the other two Logarithms, and from that Sum abate Radius, the Remainder is the Logarithmic Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. ſubtract the Degree and Minute from 180d. the Sine of the Remainder (called the Supplement) is the Sine required.

For the Second Ship's Diſtance.

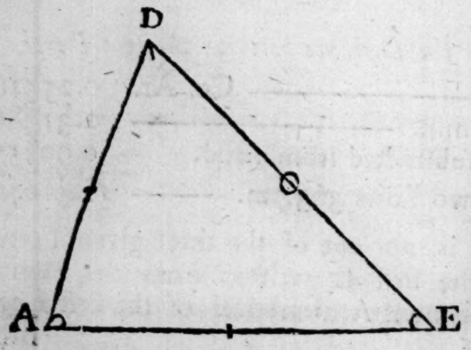
As S. AED. 33d. 45m. ——— Co. Ar. 0.255261
To AD the firſt Ship's Diſtance 206 min. ——— 2.313867
So is S. DAE 45d. 00m. ——— 9.849485
To DE the ſecond Ship's Diſtance, 262.2 min. ——— ~~1~~2.418613

By Gunter. *For the Diſtance between the two Ports.*

The Extent of the Compaſſes from S. of 33 deg 45 min. to the S. ADE 78d. 45m. (*viz.* the Supplement of 101d. 15m. to 180d) will reach from 206 min. the firſt Ship's Diſtance, to 363.7 min. the Diſtance between the two Ports, as above.

For the ſecond Ship's Diſtance.

The Extent of the Compaſſes from the S. of 33d. 45m. to the S. of 45d. 00m. will reach from 206 min. the firſt Ship's Diſtance, to 262.2 min. the ſecond Ship's Diſtance required.



PROB. II.

Two Sides and an Angle oppoſite to one of them being given, to find the other oppoſite Angle and the third Side.

Example.

Suppoſe two Ports, whoſe Bearing is North Eaſt and South Weſt, diſtant 396 Miles, a Ship at the northermoſt ſails South South Eaſt, and another Ship at the ſouthermoſt ſails thence 518 Miles, and meets with the firſt Ship: The Courſe ſailed by the ſecond Ship, and the firſt Ship's Diſtance are required.

In the Triangle A D E.

A repreſents the Southermoſt Port, D the Northermoſt.
AD the Diſtance between the two Ports.
DE the Courſe and Diſtance ſailed by the firſt Ship.
AE the Courſe and Diſtance ſailed by the ſecond Ship.

The Operation by Logarithms. *For the ſecond Ship's Courſe.*

As AE the ſecond Ship's Diſtance 518 min. —— Co. Ar. 7.285671
To S. ADE 67d. 30m. —— 9.965615
So is A D the Diſtance between the two Ports 396 min. —— 2.597695
To S AED 44 deg. 56 min. —— ~~1~~9.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and ſubtracted from 180d. gives 67d. 34m. the Angle at A, which makes neareſt 6 Points, and 6 Points reckon'd from the North Eaſt to the Southward gives ESE. the ſecond Ship's Courſe required.

For the firſt Ship's Diſtance.

As S. ADE 67d. 30m. —— Co. Ar. 0.034385
To AE the ſecond Ship's Diſtance 518m. —— 2.714330
So is S. DAE 67 deg. 34 min. —— 9.965824
To DE the firſt Ship's Diſtance 518.3 min. —— ~~1~~2.714539

By Gunter. *For the ſecond Ship's Courſe.*

The Extent of the Compaſſes from 518 min. to S. 67d. 30m. will reach from 396 min. to S. 44 deg. 56 min. which added to the Angle at D, and the Sum ſubtracted from 180d. gives 67d. 34m. the Angle at A, as above.

For the firſt Ship's Diſtance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34m. to 518.3 m. the Ship's Diſtance, as above.

PROB. III.

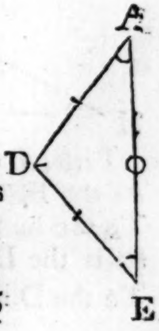
Two Sides and the contained Angle given, to find the other Angles and Side.

Example.

Suppoſe two Ships ſail from one Port; one ſails NE. 140 Miles, the other South Eaſt by Eaſt 115 Miles, the Bearing and Diſtance of theſe two Ships is required.

Let D repreſent the Port, DA the firſt Ship's diſtance, and DE the ſecond.

Miles
140
115
255
Diff. 25



The Operation by Logarithms. *For the Bearing of the two Ships.*

As the Sum of the Sides AD and DE 255 min. — Co. Ar. 7.593460
To the Difference of the ſaid Sides 25 min. 1.397940
So is the T. of half the Sum of their oppoſite Angles 50d. 37m. 10.085698
To the T. of half their Differerce, which is 6d. 48m. —— 19.677098

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference ſubtracted from it gives 43d. 49m. the leſſer Angle DAE. Wherefore the Bearing of the two Ships is N. Eaſterly, and South Weſterly 1d. 11m. *For the Diſtance of the two Ships.*

As S. AED 57d. 25m. ———————— Co. Ar. 0.074374
To AD the firſt Ship's Diſtance 140 min.———————— 2.146128
So is S. ADE 78d. 45m. ———————— 9.991574
To AE the Diſtance of the Ships, 163 min. ———————— 12.212076

By Gunter. *For the Bearing of the two Ships.*

The Extent of the Compaſſes from the Sum of the Sides 255m. to their Difference 25m. will reach from the T. of the Half Sum of the required Angles 50d. 37m. to the T. of half the Diff. of the ſaid Angle 6d. 48m.

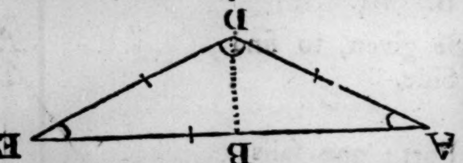
In this Proportion by *Gunter*, the Practitioner may be at a Loſs, becauſe the Point T. 50d. 37m. would fall beyond the T. of 45d. was the Tangent Line continued: To remedy which, place the Extent from 255 to 25, from the T. 45d. and it will each to the T. of 5d. 37m. then letting one Point ſtand at 5d. 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. will fall on the T. 6d. 48m. required. *For the Diſtance of the Ships.*

The Extent from the Sine of 57d. 25m. to the Sine of 78d. 45m. will reach from 140m. to 163m.

PROB. IV. Three Sides being given, to find the Angles.

Example. Suppoſe there are two Ports both in one Latitude, diſtant 536 Miles; a Ship ſails from the Eaſtward 306 Miles between the South and the Weſt; another Ship ſails from the Weſtermoſt 290 Miles, and meets with the firſt Ship. The Courſe that each Ship hath ſteered is required.

Let A and E repreſent the two Ports, D the Place where the Ships meet.



This Queſtion is reſolv'd by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles A B D and EBD, then the Operation is as follows;

Firſt, find the greater Segment to the Baſe BE, thus,

As the Baſe AE, 536 Miles ———————— Co. Ar. 7.270835
To the Sum of the Sides AD and ED 596 Miles ———————— 2.775246
So is the Difference of the ſaid Sides 16 Miles ———————— 1.204120
To the Diff. of the Segments of the Baſe, which is 17.8 Miles 11.250201

The whole Baſe ——————— 536 min.
The Difference of the Segment is ——— 17.8
Sum is ——————————— 553.8
Half Sum ——————————— 276.9 the greater Segment BE.

Then ſay, *For the firſt Ship's Courſe.*

As DE the firſt Ship's Diſtance 306 min. ——————— 2.485721
To Radius ——————————————— 10.000000
So is the greater Segment BE 276.9 min. ——————— 2.442323
To S.c. BED, 25d. 9m. ——————————— 9.956602

The Angle at E is the Courſe from the Weſt Southerly, ſo the firſt Ship ſteers South 64d. 51m. Weſt, or SW. by W. three quarters Weſt almoſt.

For the ſecond Ship's Courſe.

As AD the ſecond Ship's Diſtance 290 min. ——— Co. Ar. 7.537602
To Sine AED 25d. 9m. ——————————— 9.628378
So is DE the firſt Ship's Diſtance 306 ——————— 2.485721
To Sine DAE 26d. 39m. ——————————— 19.651701

The Angle at A is the Courſe from the Eaſt Southerly, ſo the ſecond Ship ſteers South 63d. 21m. Eaſt, or SE. by E. 3 quarters E. nearly.

By Gunter. *For the Difference of the Segments of the Baſe.*

The Extent of the Compaſſes from the Baſe AE 536 min. to the Sum of the Sides 596m. will reach from the Difference of the Sides 16, to the Difference of the Segments of the Baſe 17.8, with which proceed as before.

For the firſt Ship's Courſe.

The Extent from the Diſtance 306 min. to the greater Segment 276.9 min. will reach from Radius or Sine 90d. to Sine 64d. 51m. the Complement BED 25d. 9m. required.

For the ſecond Ship's Courſe.

The Extent from 290m. the ſecond Ship's Diſtance, to 306min. the firſt Ship's Diſtance, will reach from the Sine 25d. 9m. to the Sine 26d. 39m. the Angle at A required.

PROB. V.

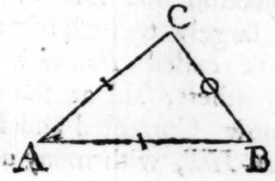
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships ſails from one Port at A; the firſt ſails Eaſt 335 Miles to B, the ſecond ſails Eaſt 14d. 40m. North, 271 Miles to C; I demand how far they are aſunder, and what is the Courſe from the Ship at C, to that at B?

In the Triangle ABC,
there is given.

AB 335
AC 271
BAC 14d. 40m. } BC required.



This Caſe requires a double Operation.
1. By the third Caſe to find the Angles.
2. By the firſt Caſe to find the Side required.

AB	335
AC	271
Sum is	606
Diff. is	64

The firſt Operation.

As the Sum of the Sides AB and AC 606 Miles ——	Co. Ar.	7.217527
To their Difference —————— 64 ——————		1.806180
So is the T. of half Sum of the Angles 82d. 40m. ——————		10.890441
To T. half their Difference ——— 39d. 22m. ——————		19.914148

By which you will find the Angle ABC, to be 43d. 18m.

The ſecond Operation.

As S. ABC 43d. 18m. ——————————	Co. Ar.	0.163791
To the Side AC 271 Miles ——————————		2.432969
So is S. BAC 14d. 40m. ——————————		9.403455
To the Side BC 100 Miles ——————————		12.000215

The Angle at B is found to be 43d. 18m. and the Line AB lying Eaſt and Weſt, the Courſe from C to B is Eaſt 43d. 18m. South, or South Eaſt 1d. 42m. Eaſterly; and the Diſtance 100 Miles.

By Gunter. *For the Angle at* B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the Sides, will reach from the Tangent of 82d. 40m. half the Sum of the unknown Angles; to the Tangent of 39d. 22m. half their Difference, which being found, proceed according to former Directions, to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the Side AC, to 100 Miles, the Side BC, as above.

Thus much for ſailing by the *Plane Chart*; which being of ſome Uſe in ſhort Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit; but nevertheleſs would adviſe all that take Charge of Ships never to content themſelves with the Uſe of the *Plane Chart* only; being ſo apparently falſe in itſelf, and ſo unſafe for Practice: Nor are we under any Neceſſity to truſt to it, the Defect thereof being now ſufficiently ſupplied by Mr. *Wright*'s True Chart, commonly called *Mercator*'s, the Projection and Uſe of which (both in ſingle Queſtions and Traverſes) are largely treated of, and rendered as eaſy as the *Plane Chart*, in the Book called *Practical Navigation*, (and at this Time treated off by many others, ſold at the ſame Place) firſt ſet forth by Mr. *John Seller*, and now Corrected and Reprinted for J. MOUNT, and T. PAGE, on *Tower-Hill*, with many uſeful Additions.

A large and uſeful

TABLE
OF
DIFFERENCE
OF
Latitude and *Departure*
IN
MINUTES and Tenths Parts,
TO
Every *Degree* and *Quarter Point*
OF THE
COMPASS,
For the exact Working of a
TRAVERSE.

LONDON:

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Dist.	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	06.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	89 Deg.		88 Deg.		7¾ Point		87 Deg		86 Deg.		85 Deg.		

Diſt	1 Deg.		2 Deg.		¼ Point		3 Deg.		4 Deg.		5 Deg.		Diſt
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	51.0	00.9	51.0	01.8	50.9	02.5	50.9	02.7	50.9	03.6	50.8	04.4	51
52	52.0	00.9	52.0	01.8	51.9	02.6	51.9	02.7	51.9	03.6	51.8	04.5	52
53	53.0	00.9	53.0	01.8	52.9	02.6	52.9	02.8	52.9	03.7	52.8	04.6	53
54	54.0	00.9	54.0	01.9	53.9	02.7	53.9	02.8	53.9	03.8	53.8	04.7	54
55	55.0	01.0	55.0	01.9	54.9	02.7	54.9	02.8	54.9	03.8	54.8	04.8	55
56	56.0	01.0	56.0	02.0	55.9	02.7	55.9	02.9	55.9	03.9	55.8	04.9	56
57	57.0	01.0	57.0	02.0	56.9	02.8	56.9	03.0	56.9	04.0	56.8	05.0	57
58	58.0	01.0	58.0	02.0	57.9	02.8	57.9	03.0	57.9	04.0	57.8	05.1	58
59	59.0	01.0	59.0	02.1	58.9	02.9	58.9	03.1	58.9	04.1	58.8	05.1	59
60	60.0	01.0	60.0	02.1	59.9	02.9	59.9	03.1	59.9	04.2	59.8	05.2	60
61	61.0	01.1	61.0	02.1	60.9	03.0	60.9	03.2	60.9	04.3	60.8	05.3	61
62	62.0	01.1	62.0	02.2	61.9	03.0	61.9	03.2	61.9	04.3	61.8	05.4	62
63	63.0	01.1	63.0	02.2	62.9	03.1	62.9	03.3	62.8	04.4	62.8	05.5	63
64	64.0	01.1	64.0	02.2	63.9	03.1	63.9	03.3	63.8	04.5	63.8	05.6	64
65	65.0	01.1	65.0	02.3	64.9	03.2	64.9	03.4	64.8	04.5	64.8	05.7	65
66	66.0	01.2	66.0	02.3	65.9	03.2	65.9	03.5	65.8	04.6	65.7	05.8	66
67	67.0	01.2	67.0	02.3	66.9	03.3	66.9	03.5	66.8	04.7	66.7	05.8	67
68	68.0	01.2	68.0	02.4	67.9	03.3	67.9	03.6	67.8	04.7	67.7	05.9	68
69	69.0	01.2	69.0	02.4	68.9	03.4	68.9	03.6	68.8	04.8	68.7	06.0	69
70	70.0	01.2	70.0	02.4	69.9	03.4	69.9	03.7	69.8	04.9	69.7	06.1	70
71	71.0	01.2	71.0	02.5	70.9	03.5	70.9	03.7	70.8	05.0	70.7	06.2	71
72	72.0	01.3	72.0	02.5	71.9	03.5	71.9	03.8	71.8	05.0	71.7	06.3	72
73	73.0	01.3	73.0	02.5	72.9	03.6	72.9	03.8	72.8	05.1	72.7	06.4	73
74	74.0	01.3	74.0	02.6	73.9	03.6	73.9	03.9	73.8	05.2	73.7	06.5	74
75	75.0	01.3	75.0	02.6	74.9	03.7	74.9	03.9	74.8	05.2	74.7	06.5	75
76	76.0	01.3	76.0	02.7	75.9	03.7	75.9	04.0	75.8	05.3	75.7	06.6	76
77	77.0	01.3	77.0	02.7	76.9	03.8	76.9	04.0	76.8	05.4	76.7	06.7	77
78	78.0	01.4	78.0	02.7	77.9	03.8	77.9	04.1	77.8	05.4	77.7	06.8	78
79	79.0	01.4	79.0	02.8	78.9	03.9	78.9	04.1	78.8	05.5	78.7	06.9	79
80	80.0	01.4	80.0	02.8	79.9	03.9	79.9	04.2	79.8	05.6	79.7	07.0	80
81	81.0	01.4	81.0	02.8	80.9	04.0	80.9	04.2	80.8	05.7	80.7	07.1	81
82	82.0	01.4	81.9	02.9	81.9	04.0	81.9	04.3	81.8	05.7	81.7	07.2	82
83	83.0	01.5	82.9	02.9	82.9	04.1	82.9	04.3	82.8	05.8	82.7	07.2	83
84	84.0	01.5	83.9	02.9	83.9	04.1	83.9	04.4	83.8	05.9	83.7	07.3	84
85	85.0	01.5	84.9	03.0	84.9	04.2	84.9	04.4	84.8	05.9	84.7	07.4	85
86	86.0	01.5	85.9	03.0	85.9	04.2	85.9	04.5	85.8	06.0	85.7	07.5	86
87	87.0	01.5	86.9	03.0	86.9	04.3	86.9	04.6	86.8	06.1	86.7	07.6	87
88	88.0	01.5	87.9	03.1	87.9	04.3	87.9	04.6	87.8	06.1	87.7	07.7	88
89	89.0	01.6	88.9	05.1	88.9	04.4	88.9	04.7	88.8	06.2	88.7	07.8	89
90	90.0	01.6	89.9	03.1	89.9	04.4	89.9	04.7	89.8	06.3	89.7	07.8	90
91	91.0	01.6	90.9	03.2	90.9	04.5	90.9	04.8	90.8	06.4	90.7	07.9	91
92	92.0	01.6	91.9	03.2	91.9	04.5	91.9	04.8	91.8	06.4	91.6	08.0	92
93	93.0	01.6	92.9	03.2	92.9	04.6	92.9	04.9	92.8	06.5	92.6	08.1	93
94	94.0	01.6	93.9	03.3	93.9	04.6	93.9	04.9	93.8	06.6	93.6	08.2	94
95	95.0	01.7	94.9	03.3	94.9	04.7	94.9	05.0	94.8	06.6	94.6	08.3	95
96	96.0	01.7	95.9	03.4	95.9	04.7	95.9	05.0	95.8	06.7	95.6	08.4	96
97	97.0	01.7	96.9	03.4	96.9	04.8	96.9	05.1	96.8	06.8	96.6	08.5	97
98	98.0	01.7	97.9	03.4	97.9	04.8	97.9	05.1	97.8	06.8	97.6	08.5	98
99	99.0	01.7	98.9	03.5	98.9	04.9	98.9	05.2	98.8	06.9	98.6	08.6	99
100	100.0	01.7	99.9	03.5	99.9	04.9	99.9	05.2	99.8	07.0	99.6	08.7	100
Diſt	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt
	89 Deg.		88 Deg.		7¾ Point		87 Deg.		86 Deg.		85 Deg		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00 1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	06.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	0.23	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	0.25	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	0.26	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	0.28	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	0.29	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.6	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.8	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.6	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Points		84 Deg.		83 Deg.		82 Deg.		7¼ Point		81 Deg.		

Dist.	½ Point		6 Deg.		7 Deg.		8 Deg.		¾ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	05.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.8	56
57	56.7	05.6	56.7	06.0	56.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.5	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.3	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	7½ Point		84 Deg.		83 Deg.		82 Deg.		7¾ Point		81 Deg.		

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01,0	00,2	01,0	00,2	01,0	00,2	01,0	00,2	01,0	00,2	01,0	00,2	1
2	02,0	00,3	02,0	00,4	02,0	00,4	02,0	00,4	01,9	00,4	01,9	00,5	2
3	03,0	00,5	02,9	00,6	02,9	00,6	02,9	00,6	02,9	00,7	02,9	00,7	3
4	03,9	00,7	03,9	00,8	03,9	00,8	03,9	00,8	03,9	00,9	03,9	01,0	4
5	04,9	00,9	04,9	01,0	04,9	01,0	04,9	01,0	04,9	01,1	04,9	01,2	5
6	05,9	01,0	05,9	01,1	05,9	01,2	05,9	01,2	05,8	01,3	05,8	01,4	6
7	06,9	01,2	06,9	01,3	06,9	01,4	06,8	01,5	06,8	01,6	06,8	01,7	7
8	07,9	01,4	07,9	01,5	07,8	01,6	07,8	01,7	07,8	01,8	07,8	01,9	8
9	08,9	01,6	08,8	01,7	08,8	01,8	08,8	01,9	08,8	02,0	08,7	02,2	9
10	09,8	01,7	09,8	01,9	09,8	02,0	09,8	02,1	09,7	02,2	09,7	02,4	10
11	10,8	01,9	10,8	02,1	10,8	02,1	10,8	02,3	10,7	02,5	10,7	02,7	11
12	11,8	02,1	11,8	02,3	11,8	02,3	11,7	02,5	11,7	02,7	11,6	02,9	12
13	12,8	02,3	12,8	02,5	12,7	02,5	12,7	02,7	12,7	02,9	12,6	03,1	13
14	13,8	02,4	13,7	02,7	13,7	02,7	13,7	02,9	13,6	03,1	13,6	03,4	14
15	14,8	02,6	14,7	02.9	14,7	02,9	14,7	03,1	14,6	03,4	14,6	03,6	15
16	15,8	02,8	15,7	03,1	15,7	03,1	15,6	03,3	15,6	03,6	15,5	03,9	16
17	16,7	03,0	16,7	03,2	16,7	03,3	16 6	03,5	16,6	03.8	16,5	04,1	17
18	17,7	03,1	17,7	03,4	17,7	03,5	17,6	03,7	17,5	04,0	17,5	04,4	18
19	18,7	03,3	18,6	03,6	18,6	03,7	18,6	03,9	18,5	04,3	18,4	04,6	19
20	19,7	03,5	19,6	03,8	19,6	03,9	19,6	04,2	19,5	04,5	19,4	04,8	20
21	20,7	03,6	20,6	04,0	20,6	04,1	20,5	04,4	20,5	04,7	20,4	05,1	21
22	21,7	03,8	21.6	04,2	21,6	04,3	21,5	04,6	21,4	04,9	21,3	05,3	22
23	22,6	04,0	22,6	04,4	22,6	04,5	22,5	04,8	22,4	05,2	22,3	05,6	23
24	23,6	04,2	23,6	04,6	23,5	04,7	23,5	05,0	23,4	05,4	23,3	05,8	24
25	24,6	04,3	24,5	04,8	24,5	04,9	24,5	05,2	24,4	05,6	24,3	06,0	25
26	25,6	04,5	25,5	05,0	25,5	05,1	25,4	05,4	25,3	05,8	25,2	06,3	26
27	26,6	04,7	26,5	05,2	26,5	05,3	26,4	05,6	26,3	06,1	26,2	06,5	27
28	27,6	04,9	27,5	05,3	27,5	05,5	27,4	05,8	27,3	06,3	27,2	06,8	28
29	28,6	05,0	28,5	05,5	28,4	05,7	28,4	06,0	28,3	06,5	28,1	07,0	29
30	29,5	05,2	29,4	05,7	29,4	05,9	29,3	06,2	29,2	06,7	29,1	07,3	30
31	30,5	05,4	30,4	05,9	30,4	06,0	30,3	06,4	30,2	07,0	30,1	07,5	31
32	31,5	05,6	31,4	06,1	31,4	06,2	31,3	06,7	31,2	07,2	31,0	07,7	32
33	32,5	05,7	32,4	06,3	32,4	06,4	32,3	06,9	32,2	07,4	32,0	08,0	33
34	33,5	05,9	33,4	06,5	33,3	06,6	33,3	07,1	33,1	07,6	33,0	08,2	34
35	34,5	06,1	34,4	06,7	34,3	06,8	34,2	07,3	34,1	07,9	34,0	08,5	35
36	35,4	06,2	35,3	06,9	35,3	07,0	35,2	07,5	35,1	08,1	34,9	08,7	36
37	36,4	06,4	36,3	07,1	36,3	07,2	36,2	07,7	36,1	08,3	35,9	09,0	37
38	37,4	06,6	37,3	07,2	37,3	07,4	37,2	07,9	37,0	08,5	36,9	09,2	38
39	38,4	06,8	38,3	07,4	38,3	07,6	38,1	08,1	38,0	08,8	37,8	09,4	39
40	39,4	06,9	39,3	07,6	39,2	07,8	39,1	08,3	39,0	09,0	38,8	09,7	40
41	40,4	07,1	40,2	07,8	40,2	08,0	40,1	08,5	39,9	09,2	39,8	09,9	41
42	41,4	07,3	41,2	08,0	41,2	08,2	41,1	08,7	40,9	09,4	40,8	10,2	42
43	42,3	07,5	42,2	08,2	42,2	08,4	42,1	08,9	41,9	09,7	41,7	10,4	43
44	43,3	07,6	43,2	08,4	43,2	08,6	43,0	09,1	42,9	09,9	42,7	10,6	44
45	44,3	07,8	44,2	08,6	44,1	08,8	44,0	09,4	43,8	10,1	43,7	10.9	45
46	45,3	08,0	45,2	08,8	45,1	09,0	45,0	09,6	44,8	10,3	44,6	11,1	46
47	46,3	08,2	46,1	09,0	46,1	09,2	46,0	09,8	45,8	10,6	45,6	11,4	47
48	47,3	08,3	47,1	09,2	47,1	09,4	47,0	10,0	46,8	10,8	46,6	11,6	48
49	48,3	08,5	48,1	09,3	48,1	09,6	47,9	10,2	47,7	11,0	47,5	11,9	49
50	49,2	08,7	49,1	09,5	49,0	09,8	48,9	10,4	48,7	11,2	48,5	12,1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Diſt	10 Deg		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Diſt
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.8	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.8	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.9	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.2	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.5	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.7	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.9	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.6	97.0	24.2	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Diſt	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		Diſt

Dist	1 ¼ Point		15 Deg.		16 Deg.		1 ½ Point		17 Deg.		18 Deg		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.6	05.8	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.5	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.5	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.6	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.4	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	6 ¾ Point		75 Deg.		74 Deg		6½ Point		73 Deg.		72 Deg.		

Diſt.	1¼ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Diſt.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49,5	12,4	49,3	13,2	49,0	14,1	48,8	14,8	48.8	14.9	48.5	15.8	51
52	50,4	12,6	50,2	13,5	50,0	14,3	49,7	15,1	49,7	15.2	49 4	16.1	52
53	51,4	12,9	51,2	13,7	50,9	14,6	50,7	15,3	50.7	15.5	50.4	16.4	53
54	52,4	13,1	52,2	14,0	51,9	14,9	51,7	15,7	51.6	15.8	51.3	16.7	54
55	53,3	13,4	53,1	14,2	52,9	15,2	52,6	16,0	52.6	16.1	52 3	17.0	55
56	54,3	13,6	54,1	14,5	53,8	15,4	53,6	16,2	53,5	16.4	53.3	17.3	56
57	55,3	13,9	55,1	14,8	54,8	15,7	54,5	16,5	54,5	16.7	54 2	17.6	57
58	56,3	14,1	56,0	15,0	55,8	16,0	55,5	16,8	55.5	17.0	55.2	17.9	58
59	57,2	14,3	57,0	15,3	56,7	16,3	56,5	17,1	56.4	17.3	56.1	18,2	59
60	58,2	14,6	58,0	15,5	57,7	16,5	57,4	17,4	57.4	17.5	57.1	18.5	60
61	59,2	14,8	58,9	15,8	58,6	16,8	58,4	17,7	58.3	17.8	58.0	18.8	61
62	60,1	15,1	59,9	16,0	59,6	17,1	59,3	18,0	59,3	18.1	59.0	19.2	62
63	61,1	15,3	60,9	16,3	60,6	17,4	60,3	18,3	60.2	18.4	59 9	19.5	63
64	62,1	15,6	61,8	16,6	61,5	17,6	61,2	18,6	61,2	18.7	60.9	19.8	64
65	63,0	15,8	62,8	16,8	62,5	17,9	62,2	18,9	62,2	19.0	61.8	20.1	65
66	64,0	16,0	63,7	17,1	63,4	18,2	63,2	19,2	63,1	19.3	62 8	20.4	66
67	65,0	16,3	64,7	17,3	64,4	18,5	64,1	19,4	64 1	19.6	63.7	20,7	67
68	66,0	16,5	65,7	17,6	65,4	18,7	65,1	19,7	65.0	19.9	64.7	21.0	68
69	66,9	16,8	66,6	17,9	66,3	19,0	66,0	20,0	66,0	20.2	65 6	21.3	69
70	67,9	17,0	67,6	18,1	67,3	19,3	67,0	20,3	66,9	20.5	66.6	21,6	70
71	68,9	17,3	68,6	18,4	68,3	19,6	67,9	20,6	67,9	20.8	67.5	21,9	71
72	69,8	17,5	69,5	18,6	69,2	19,8	68,9	20,9	68,8	21.1	68.5	22,2	72
73	70,8	17,7	70,5	18,9	70,2	20,1	69,9	21,2	69,8	21.3	69.4	22.6	73
74	71,8	18,0	71,5	19,2	71,1	20,4	70,8	21,5	70,8	21.6	70 4	22.9	74
75	72,7	18,2	72,4	19,4	72,1	20,7	71,8	21,8	71.7	21.9	71.3	23.2	75
76	73,7	18,5	73,4	19,7	73,1	20,9	72,7	22,1	72.7	22.2	72.3	23.5	76
77	74,7	18,7	74,4	19,9	74,0	21,2	73,7	22,4	73.6	22.5	73.2	23.8	77
78	75,7	18,9	75,3	20,2	75,0	21,5	74,6	22,6	74.6	22.8	74.2	24.1	78
79	76,6	19,2	76,3	20,4	75,9	21,8	75,6	22,9	75.5	23.1	75.1	24.4	79
80	77,6	19,4	77,3	20,7	76,9	22,0	76,6	23,2	76,5	23.4	76.1	24.7	80
81	78,6	19,7	78,2	21,0	77,9	22,3	77,5	23,5	77,5	23.7	77.0	25.0	81
82	79,5	19,9	79,2	21,2	78,8	22,6	78,5	23,8	78,4	24.0	78.0	25.3	82
83	80,5	20,2	80,2	21,5	79,8	22,9	79,4	24,1	79.4	24.3	78.9	25.6	83
84	81,5	20,4	81,1	21,7	80,7	23,1	80,4	24,4	80,3	24.5	79.9	26,0	84
85	82,4	20,7	82,1	22,0	81,7	23,4	81,3	24,7	81,3	24.8	80.8	26.3	85
86	83,4	20,9	83,1	22,3	82,7	23,7	82,3	25,0	82,2	25.1	81.8	26.6	86
87	84,4	21,1	84,0	22,5	83,6	24,0	83,3	25,3	83.2	25.4	82.7	26.9	87
88	85,4	21,4	85,0	22,8	84,6	24,3	84,2	25,5	84,2	25.7	83.7	27.2	88
89	86,3	21,6	86,0	23,0	85,6	24,5	85.2	25,8	85.1	26.0	84.6	27.5	89
90	87,3	21,9	86,9	23,3	86,5	24,8	86,1	26,1	86,1	26,3	85.6	27.8	90
91	88,3	22,1	87,9	23,5	87,5	25,1	87,1	26,4	87.0	26.6	86.5	28.1	91
92	89,2	22,4	88,9	23,8	88,4	25,4	88,0	26,7	88,0	26.9	87.5	28.4	92
93	90,2	22,6	89,8	24,1	89,4	25,6	89,0	27,0	88.9	27.2	88.4	28.7	93
94	91,2	22,8	90,8	24,3	90,4	25,9	90,0	27,3	89.9	27.5	89.4	29.0	94
95	92,1	23,1	91,8	24,6	91,3	26,2	90,9	27,6	90.8	27.8	90.4	29.4	95
96	93,1	23,3	92,7	24,8	92,3	26,5	91,9	27,9	91,8	28.1	91.3	29.7	96
97	94,1	23,6	93,7	25,1	93,2	26,7	92,8	28,2	92.8	28.4	92.3	30 0	97
98	95,1	23,8	94,7	25,4	94,2	27,0	93,8	28,4	93.7	28.7	93.2	30.3	98
99	96,0	24,1	95,6	25,6	95,2	27,3	94,7	28,7	94.7	28.9	94.2	30.6	99
100	97,0	24,3	96,6	25,9	96,1	27,6	95,7	29,0	95,6	29.2	95.1	30.9	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Diſt.	6¾ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		Diſt.

Dist	19 Deg.		1¾ Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.5	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.2	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.7	06.8	17.6	07.1	17.6	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	48.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.7	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.2	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	71 Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		

Dist.	19 Deg.		1¾ Point		20 Deg.		21 Deg.		22 Deg		2 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16,6	48,0	17,2	47,9	17,4	47,6	18,3	47,3	19,1	47.1	19,5	51
52	49.2	16,9	49,0	17,5	48,9	17,8	48,5	18,6	48,2	19,5	48.0	19,9	52
53	50.1	17,3	49,9	17,9	49,8	18,1	49,5	19,0	49,1	19,9	49.0	20,3	53
54	51.0	17,6	50,8	18,2	50,7	18,5	50,4	19,4	50,1	20,2	49.9	20.7	54
55	52.0	17.9	51,8	18,5	51,7	18,8	51,3	19,7	51,0	20,6	50.8	21,0	55
56	52.9	18,2	52,7	18,9	52,6	19,2	52,3	20,1	51,9	21,0	51.7	21,4	56
57	53.9	18,6	53,7	19,2	53,6	19,5	53,2	20,4	52,8	21,4	52.7	21,8	57
58	54.8	18,9	54,6	19,5	54,5	19,8	54,1	20,8	53,8	21,7	53.6	22,2	58
59	55.8	19,2	55,5	19,9	55,4	20,2	55,1	21,1	54,7	22,1	54.5	22,6	59
60	56.7	19,5	56,5	20,2	56,4	20,5	56,0	21,5	55,6	22,5	55.4	23,0	60
61	57.7	19,9	57,4	20,6	57,3	20,9	56,9	21,9	56,5	22,8	56.4	23,3	61
62	58.6	20,2	58,4	20,9	58,3	21,2	57,9	22,2	57,5	23,2	57.3	23,7	62
63	59.6	20,5	59,3	21,2	59,2	21,5	58,8	22,6	58,4	23,6	58.2	24,1	63
64	60.5	20,8	60,3	21,6	60,1	21,9	59,7	22,9	59,3	24,0	59.1	24,5	64
65	61.5	21,2	61,2	21,9	61,1	22,2	60,7	23,3	60,3	24,3	60.1	24,9	65
66	62.4	21,5	62,1	22,2	62,0	22,6	61,6	23,7	61,2	24,7	61.0	25,3	66
67	63,3	21,8	63,1	22,6	63,0	22,9	62,6	24,0	62,1	25,1	61.9	25,6	67
68	64.3	22,1	64,0	22,9	63,9	23,3	63,5	24,4	63,0	25,5	62.8	26,0	68
69	65.2	22,5	65,0	23,2	64,8	23,6	64,4	24,7	64,0	25,8	63.7	26,4	69
70	66.2	22,8	65,9	23,6	65,8	23,9	65,4	25,1	64,9	26,2	64.7	26,8	70
71	67.1	23,1	66,8	23,9	66,7	24,3	66,3	25,4	65,8	26,6	65.6	27,2	71
72	68.1	23,4	67,8	24,3	67,7	24,6	67,2	25,8	66,8	27.0	66.5	27,6	72
73	69.0	23,8	68,7	24,6	68,6	25,0	68,2	26,2	67,7	27,3	67.4	27,9	73
74	70.0	24,1	69,7	24,9	69,5	25,3	69,1	26,5	68,6	27,7	68.4	28,3	74
75	70.9	24,4	70,6	25,3	70,5	25,6	70,0	26,9	69,5	28,1	69.3	28,7	75
76	71.9	24,7	71,6	25,6	71,4	26,0	71,0	27,2	70,5	28,5	70.2	29,1	76
77	72.8	25,1	72,5	25,9	72,4	26,3	71,9	27,6	71,4	28,8	71.1	29,5	77
78	73.7	25,4	73,4	26,3	73,3	26,7	72,8	28,0	72,3	29,2	72.1	29,8	78
79	74.7	25,7	74,4	26,6	74,2	27,0	73,8	28,3	73,2	29,6	73.0	30,2	79
80	75.6	26,0	75,3	27,0	75,2	27,4	74,7	28,7	74,2	30,0	73.9	30,6	80
81	76.6	26,4	76,3	27,3	76,1	27,7	75,6	29,0	75,1	30,3	74.8	31,0	81
82	77.5	26,7	77,2	27,6	77,1	28,0	76,6	29,4	76,0	30,7	75.8	31,4	82
83	78.5	27,0	78,1	28,0	78,0	28,4	77,5	29,7	77,0	31,1	76.7	31,8	83
84	79.4	27,3	79,1	28,3	78,9	28,7	78,4	30,1	77,9	31,5	77.6	32,1	84
85	80.4	27,7	80,0	28,6	79,9	29,1	79,4	30,5	78,8	31,8	78.5	32,5	85
86	81.3	28,0	81,0	29,0	80,8	29,4	80,3	30,8	79,7	32,2	79.5	32,9	86
87	82.3	28,3	81,9	29,3	81,8	29,8	81,2	31,2	80,7	32,6	80.4	33,3	87
88	83,2	28,7	82,9	29,6	82,7	30,1	82,2	31,5	81,6	33,0	81.3	33,7	88
89	84.1	29,0	83,8	30,0	83,6	30,4	83,1	31,9	82,5	33,3	82,2	34,1	89
90	85.1	29,3	84,7	30,3	84,6	30,8	84,0	32,3	83,4	33,7	83.2	34,4	90
91	86.0	29,6	85,7	30,7	85,5	31,1	85,0	32,6	84,4	34,1	84.1	34,8	91
92	87.0	30,0	86,6	31,0	86,5	31,5	85,9	33,0	85,3	34,5	85.0	35,2	92
93	87.9	30,3	87,6	31,3	87,4	31,8	86,8	33,3	86,2	34,8	85.9	35,6	93
94	88.9	30,6	88,5	31,7	88,3	32,1	87,8	33,7	87,2	35,2	86.8	36,0	94
95	89.8	30,9	89,4	32,0	89,3	32,5	88,7	34,0	88,1	35,6	87.8	36,4	95
96	90,8	31,3	90,4	32,3	90,2	32,8	89,6	34,4	89,0	36,0	88.7	36,7	96
97	91,7	31,6	91,3	32,7	91,1	33,2	90,6	34,8	89,9	36,3	89.6	37,1	97
98	92,7	31,9	92,3	33,0	92,1	33,5	91,5	35,1	90,9	36,7	90.5	37,5	98
99	93,6	32,2	93,2	33,4	93,0	33,9	92,4	35,5	91,8	37,1	91.5	37,9	99
100	94,5	32,6	94,2	33,7	94,0	34,2	93,4	35,8	92,7	37,5	92.4	38,3	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	71. Deg.		6¼ Point		70 Deg.		69 Deg.		68 Deg.		6 Points		Dist.

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.6	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.2	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.5	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.6	22.7	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		Dist.

Dist.	23 Deg.		24 Deg.		25 Deg.		2¼ Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.6	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.8	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.6	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.3	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.3	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.2	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	67 Deg.		66 Deg.		65 Deg.		5¾ Point		64 Deg.		63 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	00,9	00,5	1
2	01,8	00,9	01,8	00,9	01,7	01,0	01,7	01,0	01,7	01,0	01,7	01,0	2
3	02,6	01,4	02,6	01,4	02,6	01,5	02,6	01,5	02,6	01,5	02,6	01,5	3
4	03,5	01,9	03,5	01,9	03,5	01,9	03,5	02,0	03,4	02,1	03,4	02,1	4
5	04,4	02,3	04,4	02,4	04,4	02,4	04,3	02,5	04,3	02,6	04,3	02,6	5
6	05,3	02,8	05,3	02,8	05,2	02,9	05,2	03,0	05,1	03,1	05,1	03,1	6
7	06,2	03,3	06,2	03,3	06,1	03,4	06,1	03,5	06,0	03,6	06,0	03,6	7
8	07,1	03,8	07,1	03,8	07,0	03,9	06,9	04,0	06,9	04,1	06,9	04,1	8
9	07,9	04,2	07,9	04,2	07,9	04,4	07,8	04,5	07,7	04.6	07,7	04,6	9
10	08,8	04,7	08,8	04,7	08,7	04,8	08,7	05,0	08,6	05,1	08,6	05,1	10
11	09,7	05,2	09,7	05,2	09,6	05,3	09,5	05,5	09,4	05,7	09,4	05,7	11
12	10,6	05,6	10,6	05,7	10,5	05,8	10,4	06,0	10,3	06,2	10,3	06,2	12
13	11,5	06,1	11,5	06,1	11,4	06,3	11,3	06,5	11,1	06,7	11,1	06,7	13
14	12,4	06,6	12,3	06,6	12,2	06,8	12,1	07,0	12,0	07,2	12,0	07,2	14
15	13,2	07,0	13,2	07,1	13,1	07,3	13,0	07,5	12,9	07,7	12,9	07,7	15
16	14,1	07,5	14,1	07,5	14,0	07,8	13,9	08,0	13,7	08,2	13,7	08,2	16
17	15,0	08,0	15,0	08,0	14,9	08,2	14,7	08,5	14,6	08,7	14,6	08,8	17
18	15,9	08,5	15,9	08,5	15,7	08,7	15,6	09,0	15,4	09,3	15,4	09,3	18
19	16,8	08,9	16,8	09,0	16,6	09,2	16,5	09,5	16,3	09,8	16,3	09,8	19
20	17,7	09,4	17,6	09,4	17,5	09,7	17,3	10,0	17,2	10,3	17,2	10,3	20
21	18,5	09,9	18,5	09,9	18,4	10,2	18,2	10,5	18,0	10,8	18,0	10,8	21
22	19,4	10,3	19,4	10,4	19,2	10,7	19,1	11,0	18,9	11,3	18,9	11,3	22
23	20,3	10,8	20,3	10,8	20,1	11,1	19,9	11,5	19,7	11,8	19,7	11,8	23
24	21,2	11,3	21,2	11,3	21,0	11,6	20,8	12,0	20,6	12,3	20,6	12,3	24
25	22,1	11,7	22,0	11,8	21,9	12,1	21,6	12,5	21,4	12,9	21,4	12,9	25
26	23,0	12,2	22,9	12,3	22,7	12,6	22,5	13,0	22,3	13,4	22,3	13,4	26
27	23,8	12,7	23,8	12,7	23,6	13,1	23,4	13,5	23,2	13,9	23,1	13,9	27
28	24,7	13,1	24,7	13,2	24,5	13,6	24,2	14,0	24,0	14,4	24,0	14,4	28
29	25,6	13,6	25,6	13,7	25,4	14,1	25,1	14,5	24,9	14,9	24,9	14,9	29
30	26,5	14,1	26,5	14,1	26,2	14,5	26,0	15,0	25,7	15,4	25,7	15,4	30
31	27,4	14,6	27,3	14,6	27,1	15,0	26,8	15,5	26,6	15,9	26,6	16,0	31
32	28,3	15,0	28,2	15,1	28,0	15,5	27,7	16,0	27,4	16,4	27,4	16,5	32
33	29,1	15,5	29,1	15,6	28,9	16,0	28,6	16,5	28,3	17,0	28,3	17,0	33
34	30,0	16,0	30,0	16,0	29,7	16,5	29,4	17,0	29,2	17,5	29,1	17,5	34
35	30,9	16,4	30,9	16,5	30,6	17,0	30,3	17,5	30,0	18,0	30,0	18,0	35
36	31,8	16,9	31,7	17,0	31,5	17,5	31,2	18,0	30,9	18,5	30,9	18,5	36
37	32,7	17,4	32,6	17,4	32,4	17,9	32,0	18,5	31,7	19,0	31,7	19,1	37
38	33,5	17,8	33,5	17,9	33,2	18,4	32,9	19,0	32,6	19,5	32,6	19,6	38
39	34,4	18,3	34,4	18,4	34,1	18,9	33,8	19,5	33,4	20,0	33,4	20,1	39
40	35,3	18,8	35,3	18,9	35,0	19,4	34,6	20,0	34,3	20,6	34,3	20,6	40
41	36,2	19,2	36,2	19,3	35,9	19,9	35,5	20,5	35,2	21,1	35,1	21,1	41
42	37,1	19,7	37,0	19,8	36,7	20,4	36,4	21,0	36,0	21,6	36,0	21,6	42
43	38,0	20,2	37,9	20,3	37,6	20,8	37,2	21,5	36,9	22,1	36,9	22,1	43
44	38,8	20,7	38,8	20,7	38,5	21,3	38,1	22,0	37,7	22,6	37,7	22,7	44
45	39,7	21,1	39,7	21,2	39,4	21,8	39,0	22,5	38,6	23,1	38,6	23,2	45
46	40,6	21,6	40,6	21,7	40,2	22,3	39,8	23,0	39,5	23,6	39,4	23,7	46
47	41,5	22,1	41,4	22,2	41,1	22,8	40,7	23,5	40,3	24,2	40,3	24,2	47
48	42,4	22,5	42,3	22,6	42,0	23,3	41,6	24,0	41,2	24,7	41,1	24,7	48
49	43,3	23,0	43,2	23,1	42,9	23,8	42,4	24,5	42,0	25,2	42,0	25,2	49
50	44,1	23,5	44,1	23,6	43,6	24,2	43,3	25,0	42,9	25,7	42,9	25,7	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	62 Deg.		5½ Points		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist	28 Deg.		2½ Point		29 Deg.		30 Deg.		2¾ Point		31 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.6	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.0	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.6	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.2	84.0	46.5	83.1	48.0	82.3	49.3	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	62 Deg.		5½ Point		61 Deg.		60 Deg.		5¼ Point		59 Deg.		

Dist.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.2	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.4	01.8	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.3	04.9	03.4	04.9	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.6	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.5	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.2	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.6	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist.	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		Dist.

Dist	32 Deg		33 Deg.		3 Points.		34 Deg.		35 Deg		36 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
52	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
53	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
54	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
55	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
56	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
57	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
58	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
59	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
60	50.9	31.8	50.3	32.7	49.9	33.9	49.7	33.6	49.2	34.4	48.5	35.3	60
61	51.7	32.3	51.2	33.2	50.7	33.9	50.6	34.1	50.0	35.0	49.3	35.9	61
62	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
63	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
64	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
65	45.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
66	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
67	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
68	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
69	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
70	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
71	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
72	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
73	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
74	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
75	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
76	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
77	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
78	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
79	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
80	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
81	68.7	42.9	67.9	44.1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
82	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
83	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
84	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
85	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
86	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
87	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
88	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
89	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
90	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
91	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
92	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
93	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
94	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
95	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
96	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
97	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
98	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
99	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
100	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
Dist	58 Deg.		57 Deg.		5 Points		56 Deg.		55 Deg.		54 Deg.		Dist

Diſt	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Diſt
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00,8	00,6	00,8	00,6	00,8	00,6	00,8	00,6	00,8	00,6	00,8	00,6	1
2	01,6	01,2	01,6	01,2	01,6	01,2	01,6	01,3	01,5	01,3	01,5	01,3	2
3	02,4	01,8	02,4	01,8	02,4	01,8	02,3	01,9	02,3	01,9	02.3	01,9	3
4	03,2	02,4	03,2	02.4	03,2	02,5	03,1	02,5	03,1	02,5	03,1	02,6	4
5	04,0	03,0	04,0	03,0	03,9	03,1	03,9	03,1	03,9	03,2	03,8	03,2	5
6	04.8	03,6	04,8	03,6	04,7	03,7	04,7	03,8	04,6	03.8	04,6	03,9	6
7	05,6	04,2	05,6	04,2	05,5	04,3	05,4	04,4	05,4	04,4	05,4	04,5	7
8	06,4	04,8	06,4	04,8	06,3	04,9	06,2	05,0	06,2	05,1	06,1	05,1	8
9	07,2	05,4	07,2	05,4	07,1	05,5	07,0	05,7	07,0	05,7	06,9	05,8	9
10	08,0	06,0	08,0	06,0	07,9	06,2	07,8	06,3	07,7	06,3	07,7	06,4	10
11	08.8	06,6	08,8	06,6	08,7	06,8	08,5	06,9	08,5	07,0	08,4	07,1	11
12	09,6	07,1	09,6	07,2	09,5	07,4	09,3	07,6	09,3	07,6	09,2	07,7	12
13	10,4	07,7	10,4	07,8	10,2	08,0	10,1	08,2	10,0	08,2	10,0	08,4	13
14	11,2	08,3	11,2	08,4	11,0	08,6	10,9	08,8	10,8	08,9	10,7	09,0	14
15	12,0	08,9	12,0	09,0	11,8	09,2	11,7	09,4	11,6	09,5	11,5	09,6	15
16	12 9	09 5	12,8	09,6	12,6	09,9	12,4	10,1	12,4	10,1	12,3	10,3	16
17	13,7	10,1	13,6	10,2	13,4	10,5	13,2	10,7	13,1	10,8	13,0	10,9	17
18	14,5	10,7	14,4	10,8	14,2	11,1	14,0	11,3	13,9	11,4	13,8	11,6	18
19	15,3	11,3	15,2	11,4	15,0	11,7	14,8	12,0	14,7	12,1	14,6	12,2	19
20	16,1	11,9	16,0	12,0	15,8	12,3	15,5	12,6	15,5	12,7	15,3	12,9	20
21	16 9	12,5	16,8	12,6	16,5	12,9	16 3	13,2	16,2	13,3	16,1	13,5	21
22	17,7	13,1	17,6	13,2	17,3	13,5	17,1	13,8	17,0	14,0	16,9	14,1	22
23	18,5	13,7	18,4	13,8	18,1	14,2	17,9	14,5	17,8	14,6	17,6	14,8	23
24	19,3	14,3	19,2	14,4	18,9	14,8	18,6	15,1	18,6	15,2	18,4	15,4	24
25	20,1	14,9	20,0	15,0	19,7	15,4	19,4	15,7	19,3	15,9	19,1	16,1	25
26	20 9	15,5	20,8	15,6	20,5	16,0	20,2	16,4	20,1	16,5	19,9	16,7	26
27	21,7	16,1	21.6	16,2	21,3	16,6	21,0	17,0	20,9	17,1	20,7	17,4	27
28	22,5	16,7	22,4	16,8	22,1	17,2	21,8	17,6	21,6	17,8	21,4	18,0	28
29	23,3	17,3	23,2	17,5	22,9	17,9	22,5	18,2	22,4	18,4	22,2	18,6	29
30	24,1	17,9	24,0	18,1	23,6	18,5	23,3	18,9	23,2	19,0	23,0	19,3	30
31	24.9	18,5	24,8	18,7	24,4	19,1	24,1	19,5	24,0	19,7	23,7	19,9	31
32	25,7	19,1	25,6	19,3	25,2	19,7	24,9	20,1	24,7	20,3	24,5	20,6	32
33	26,5	19,7	26,4	19,9	26,0	20,3	25,6	20,8	25,5	20,9	25,3	21,2	33
34	27,3	20,3	27,2	20,5	26,8	20,9	26,4	21,4	26,3	21,6	26,0	21,9	34
35	28,1	20,8	28,0	21,1	27,6	21,5	27,2	22,0	27,1	22,2	26,8	22,5	35
36	28.9	21,4	28,7	21,7	28,4	22,2	28,0	22,7	27.8	22,8	27,6	23,1	36
37	29,7	22,0	29,5	22,3	29,2	22,8	28,8	23,3	28,6	23,5	28,3	23,8	37
38	30,5	22,6	30,3	22,9	29,9	23,4	29,5	23,9	29,4	24,1	29,1	24,4	38
39	31,3	23,2	31,1	23,5	30,7	24,0	30,3	24,5	30,1	24,7	29,9	25,1	39
40	32,1	23,8	31.9	24,1	31,5	24,6	31,1	25,2	30,9	25,4	30,6	25,7	40
41	32.9	24,4	32,7	24,7	32,3	25,2	31,9	25,8	31,7	26,0	31,4	26,4	41
42	33,7	25,0	33,5	25,3	33,1	25,9	32,6	26,4	32,5	26,6	32,2	27,0	42
43	34,5	25,6	34,3	25,9	33,9	26,5	33,4	27,1	33,2	27,3	32,9	27,6	43
44	35,3	26,2	35,1	26,5	34,7	27,1	34,2	27,7	34,0	27,9	33,7	28,3	44
45	36,1	26,8	35,9	27,1	35,5	27,7	35,0	28,3	34.8	28,5	34,5	28,9	45
46	36.9	27,4	36,7	27,7	36,2	28,3	35,7	28,9	35,6	29,2	35,2	29,6	46
47	37,7	28,0	37,5	28,3	37,0	28,9	36,5	29,6	36,3	29,8	36,0	30.2	47
48	38,6	28,6	38,3	28,9	37.8	29,6	37,3	30,2	37,1	30,5	36,8	30,9	48
49	39,4	29,2	39,1	29,5	38,6	30,2	38,1	30,8	37,9	31,1	37,5	31,5	49
50	40,2	29,8	39,9	20,1	39,4	30,8	38,9	31,5	38,6	31,7	38,3	32,1	50
Diſt	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt
	[illegible]¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg.		

Dist	3¼ Point		37 Deg.		38 Deg.		39 Deg.		3½ Point		40 Deg.		Dist
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41,0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45,0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61,0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.9	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62,2	50.3	61.8	50.8	61.3	51.4	80
81	65,1	48.3	64.7	48.7	63,8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63,7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69,1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73,1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.3	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75,9	57.2	74,9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77,1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
Dist	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist
	4¾ Point		53 Deg.		52 Deg.		51 Deg.		4½ Point		50 Deg		

Dist.	41 Deg		42 Deg.		3¾ Point		43 Deg.		44 Deg		4 Points.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	03.0	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	4.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.5	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.8	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.2	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.7	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
Dist.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dist.
	49 Deg.		48 Deg		4¼ Point		47 Deg.		46 Deg.		4 Points.		

Diſt	41 Deg.		42 Deg.		3¾ Point		43 Deg.		44 Deg.		4 Points		Diſt
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	48.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.1	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	50.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	61.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
Diſt	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diſt
	49 Deg.		48 Deg.		4¼ Point		47 Deg.		46 Deg.		4 Points		

The Uſe and Explanation of the Table of Difference *of* Latitude *and* Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, it gives the Difference of Latitude and Departure in Minutes and Tenths, to any Diſtance not exceeding 100 Miles, and to every Degree and Quarter Point of the Compaſs; and may be uſed to a greater Diſtance being taken out at twice or thrice, according to the Quantity of the Diſtance, as ſhall be ſhewn in the Uſe.

The Courſe ſtands at the Head and Foot of the Table, to every Degree and Quarter Point of the Compaſs; at the Head it begins at 1 deg. ſo 2 deg. $\frac{1}{4}$ Point, *&c.* encreaſing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, ſo 46 deg. 47 deg. $4\frac{1}{4}$ Points, *&c.* encreaſing backwards to 90 deg. or 8 Points. The Diſtance ſtands in the two outmoſt Columns under the Title *Diſt.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 51, and runs to 100, the Difference of Latitude and Departure ſtands under the Courſe at the Head, and over it at the Foot of the Table.

The Uſe of the TABLE.

This Table is very uſeful in Navigation, eſpecially in working a *Traverſe.*

Example 1. The Courſe and Diſtance given, to find the Difference of Latitude and Departure by the Table.

Suppoſe a Ship ſails NNE. 3 quarters E. 95 Miles, the Difference of Latitude and Departure are required.

On the Right-hand Page (becauſe the Diſtance is above 50) and at the Top (becauſe it is leſs than 4 Points) look for $2\frac{3}{4}$ Points, which is the Courſe; under which, and againſt 95 the Diſtance, and under the Title *Lat.* ſtands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* ſtands 48.8, which is 48 min. $\frac{8}{10}$ the Departure required?

Example 2. Suppoſe a Ship ſails South 56 deg. Weſterly 48 Miles, the Difference of Latitude and Departure required?

On the Left-hand Page (becauſe the Diſtance is leſs than 50) and at the Bottom (becauſe it is more than 45d.) look for 56d. the Courſe; over which, and againſt 48 the Diſtance, over the Title *Lat.* ſtands 26.8, that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* ſtands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required?

Example 3. Suppoſe a Ship ſails North Weſt by North 160 Miles, the Difference of Latitude and Departure are required by the Table?

On the Right-hand Page at the Top, look for 3 Points the Courſe. Now becauſe the Table goes to but 100, take for 100 firſt; therefore under 3 Points, and againſt 100, under the Title *Lat.* ſtands 83.1, that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* ſtands 55.6

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that is 55 min. 6 tenths the Departure; then for 60 under 3 Points, againſt 60 under the Title *Lat.* ſtands 49.9, that is 49 min. 9 tenths the Difference of Latitude, and under the Title *Dep.* ſtands 33.3 that is 33 min. 3 tenths the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88.9 tenths, the Departure required.

This Table is alſo uſeful in the Reſolution of the reſt of the Problems of *Plane Sailing*, which for Brevity-ſake are omitted here, being taught at large in the laſt Edition of *Practical Navigation*; but the general Uſe of it is in the exact Working of a Traverſe.

Example 1. Suppoſe a Ship bound to a certain Port, ſails S. E. by S. 49 min. then ESE. half E. 52 min. then E. by N. half E. 62 min. then SSW. half W. 57 min. then S. half E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the ſeveral Courſes and Diſtances, firſt allowing for Lee-way, if any; then proceed to look out the Difference of Latitude and Departure for each Courſe and Diſtance (by the Directions before given) in the Table, placing them in their proper Columns, *(viz.)* If the Courſe be Northerly, the Difference of Latitude muſt be put in the North Column; if Southerly in the South Column; if the Departure be Eaſterly it muſt be put in the Eaſt Column; if Weſterly in the Weſt Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and ſubtract the leſſer Difference of Latitude and Departure from the greater, the Remainder is the general Difference of Latitude and Departure.

The TABLE.

Courſes.	*Diſtances*	*Diff. of Lat.*		*Departure*	
		North	*South*	*Eaſt*	*Weſt*
S. E. by S.	49		40.7	27.2	
ESE. half E.	52		15.1	49.7	
E. by N. ½ E.	62	06.1		61.7	
S.S.W. ½ W.	57		50.3		26.9
S. half E.	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			06.1	26.9	
			138.8	115.5	

The general Diff. of Lat. is 138.8 tenths S. the Dep. 115.5 tenths E. then to find the Courſe and Diſtance, find the Lat. and Dep. in their proper Columns, but the Tables not extending ſo far, I take half of each, *viz.* half the Diff. of Lat. 69.4. and half the Dep. 57.7, the neareſt to which, in the Columns of Lat. and Dep. in the Traverſe Table is 69.6 and 57.1, over which at the Top I find 3½ Point for the Courſe South Eaſterly, or South Eaſt half South, and in the Column of Diſt. 90, which doubled (becauſe I took half the two Numbers) is 180 the Diſtance required.

Example 2. The Courſe given in Degrees, which often happens, by reaſon of Allowance for the Variation of the Compaſs, and in the like Caſes.

Suppoſe a Ship bound to a certain Port, ſails 65 Miles North, 34 deg. Weſterly. Then 56 Miles North, 67 deg. Weſterly. Then 48 Miles South 78 deg. Weſterly. Then 54 Miles North, 23 deg. Eaſterly. Then 36 Miles North, 6 deg. Eaſterly, the Difference of Latitude and Departure are requed

The TALBE

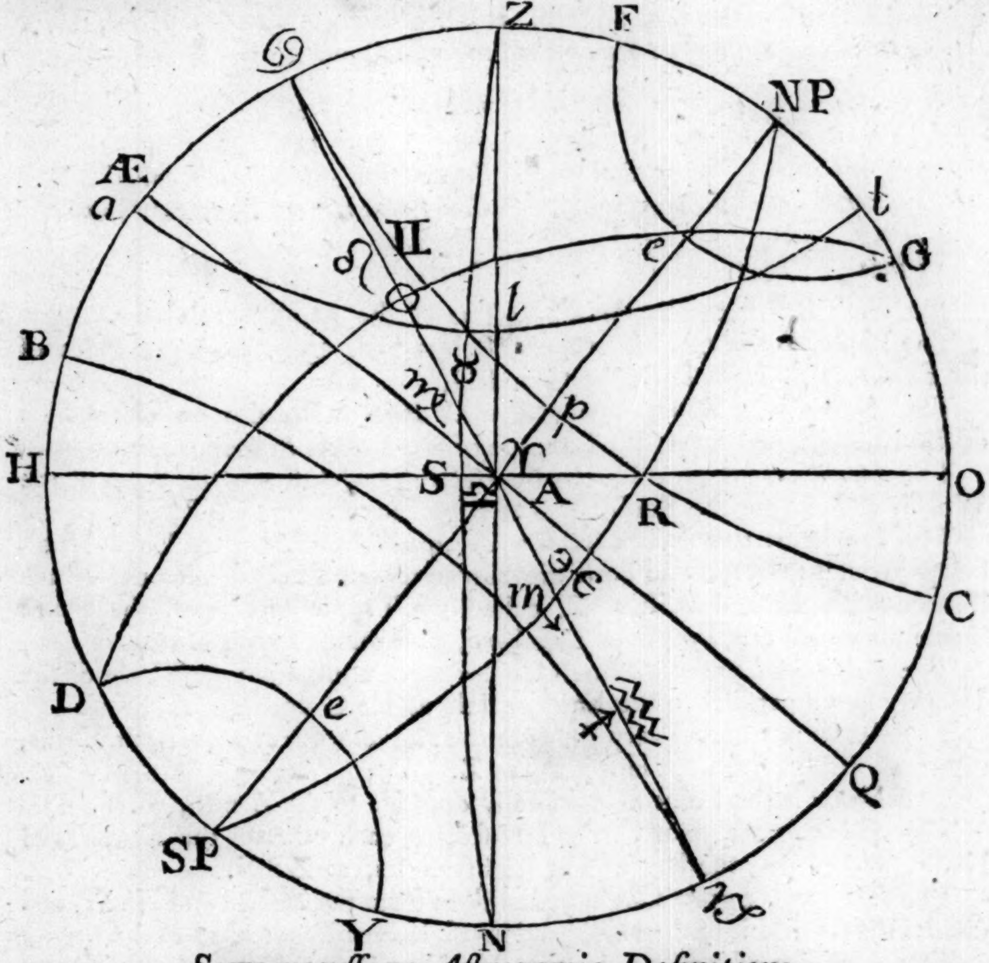
Courſes.	*Diſtances*	*Diff. of Latitude*		*Departure*	
		North.	*South*	*Eaſt*	*Weſt*
NW 34°	65	53.9			36.3
NW 67°	56	21.9			51.5
SW 78°	48		10.0		47.0
NE 23°	54	49.7		21.1	
NE 6°	36	35.8		03.8	
		161.3	10.0	24 9	134.8
		10.0			24.9
		151.3			109.9

The general Difference of Latitude is 151.3 North, the Departure 109.9 Weſt. The Courſe and Diſtance is found as in the laſt Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may alſo find the Difference of Longitude by the *Traverſe Table* (according to *Middle Latitude* Sailing) thus, find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right againſt that in the Column of Diſtance, you have the Difference of Longitude; if your Departure is too large for the Table, take one-half or one-third thereof, and proceed as before.

Example. Suppoſe in the laſt Inſtance of a *Traverſe*, the Ship hath ſailed from Latitude 50 deg. 00 min. North, then becauſe the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is 52 deg. 31 min. and conſequently the Middle Latitude is 51 deg. 16 min. it's Complement 38 deg. 44 min. which being neareſt 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding ſo far, I take its half, *viz.* 55, the neareſt to which in the Table, is, 54.7 (being leſs) againſt which, in the Column of Diſtance is 87, which doubled (becauſe I took half the Departure) the Sum 174 min. or 2d. 54 min. is the Difference

Longitude required, which is ſufficiently exact for common Practice, only I would adviſe all Perſons for avoiding as much as poſſible any Error, that every Time the Reckoning is corrected by an Obſervation, the Longitude be alſo corrected according to *Mercator's Sailing*, as you are taught in the laſt Edition of *Practical Navigation*.



Some neceſſary Aſtronomic Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, oppoſite one to the other; the one viſible to us, called the North Pole, marked with the Letters N. P; the other not viſible to us, called the South Pole, marked with S. P.

The *Axis* of the World is a Line imagined to paſs from Pole to Pole, about which is performed the diurnal Revolution, as the Line NP, A, SP.

The *Equinoctial* is a great Circle 90 deg. diſtant from the Poles of the World, and divides the Globe into the North and South Hemiſpheres; it is noted by the Letters Æ A Q.

The *Ecliptic* is a great Circle interſecting the Equinoctial in two oppoſite Points, the beginning of *Aries*, and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

Aries	♈	called Northern Signs.	*Libra*	♎	called Southern Signs.
Taurus	♉		*Scorpio*	♏	
Gemini	♊		*Sagittarius*	♐	
Cancer	♋		*Capricornus*	♑	
Leo	♌		*Aquarius*	♒	
Virgo	♍		*Piſces*	♓	

The *Ecliptic* is noted by the Characters of the 12 Signs as above.

The Poles of the *Ecliptic* are two Points 23d. 29m. from the Poles of the Equinoctial, repreſented by G and D.

The *Zodiac* is a Zone, having about 8 deg. in Breadth on either Side of the Ecliptic, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great Circles interſecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NP, R, SP.

The *Tropics* are two ſmall Circles 23d. 29m. diſtant from the Equinoctial, being parallel thereto, and limit the Sun's greateſt Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*, the South Tropic is called the Tropic of *Capricorn*, and marked with B ♑.

The *Polar Circles* are two ſmall Circles 23d. 29m. from each Pole of the World, being parallel to the Equinoctial, as F e G and D e Y.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, *viz.* 90d. diſtant from the Horizon, as Z.

The *Nadir* is the Point diametrically oppoſite to the Zenith, as N.

The *Azimuths* are great Circles interſecting each other in the Zenith and Nadir, and cutting the Horizon at Right-angles, as Z S N.

The *Horizon* is a great Circle 90d. diſtant from the Zenith and Nadir, and divides the World into the viſible and inviſible Hemiſpheres, as H A O.

The *Meridian* of a Place, is that Meridian that paſſeth by the Zenith and the Nadir, of the ſaid Place, and is repreſented by the Circle ZNPOQNSPHÆZ.

Parallels of Altitude or *Almicanters*, are ſmall Circles parallel to the Horizon; imagined to paſs through any Degree of Altitude, between the Horizon and the Zenith, as *a l t*.

Parallels of Declination or *Latitude*, are ſmall Circles parallel to the Equinoctial, and are called Parallels of Declination, with reſpect to the Heavens, and Parallels of Latitude reſpecting the Earth, as ♋ *p* R C.

Circles of the Longitude in the Heavens, are great Circles interſecting each other in the Poles of the Ecliptic, and cutting the Ecliptic at right Angles, as G, ⊙, D.

Parallels of Latitude in the Heavens, are ſmall Circles parallel to the Ecliptic.

The *Latitude* of a Star is an Arch of a Circle of Longitude contained between the Center of the Star and the Ecliptic, and is accounted either Northerly or Southerly,

The *Longitude* of a Star is an Arch of the Ecliptic, intercepted between a Circle of Longitude paſſing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star is an Arch of the Meridian contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Aſcenſion* is that Degree and Minute of the Equinoctial that comes to the Meridian with the Center of the Sun or Star.

Oblique Aſcenſion is the Degree and Minute of the Equinoctial that riſeth with the Center of the Sun or Star, in an Oblique Sphere.

Oblique Deſcenſion is the Degree and Minute of the Equinoctial that ſets with the Center of the Sun or Star, in an Oblique Sphere.

Aſcenſional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Deſcenſion or Aſcenſion, or it is the Difference of the Time between the Sun-riſing or ſetting, and ſix o'Clock.

The *Amplitude* is an Arch of the Horizon, being the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt or Weſt, and is accounted either Northerly or Southerly.

The *Latitude* of a Place is the Height of the Pole above the Horizon, or the Diſtance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equator contained between the Meridian of the Place where the Longitude is aſſigned to begin, and the Meridian of any other Place, and is accounted either Eaſterly or Weſterly.

Aſtronomic Problems uſeful in NAVIGATION.

PROBLEM I.

THE Sun's Place and greateſt Declination given, to find it's preſent Declination.

Example.

Suppoſe the Sun's Place to be 20d. 30m. in *Gemini*, the greateſt Declination is 23d. 29m. it is required to find the preſent Declination.

The Operation by the Logarithms.

As Radius	10.000000
Is to S. Sun's greateſt Declination 23d. 29m.	9.600409
So is S. Sun's Longitude 80d. 30m. from *Aries*	9.994003
To S. Sun's preſent Declination 23d. 09m. North	~~1~~9.594412

By Gunter.

The Extent from Radius S. 90d. to S. 23d. 29m. will reach from S. 80d. 30m. to the S. 23d. 9m. the Sun's Declin. N. becauſe in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point; therefore if the Sun be in *Aries*, *Taurus*, *Gemini*, *Capricornus*, *Aquarius* or *Piſces*, the Longitude is accounted from *Aries*, but if in *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, it is accounted from *Libra*.

Aries, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, are called Northern Signs, *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius* and *Piſces*, are called Southern Signs. Conſequently, if the Sun's Place be in any of the firſt ſix Signs, the Declination is North; but if in any of the latter ſix, the Declination is South.

PROB. II.

The Sun's greateſt Declin. and preſent Declin. given, to find his Place.

The Sun's greateſt Declination is 23d. 29m. and preſent Declination is 18d. 30m. North increaſing, the Sun's Place required?

By the Logarithms.

As the S. of the Sun's greateſt Declination 23d. 29m.	9.600409
To the Radius	10.000000
So is the Sine of the preſent Declination 18d. 30m. North	9.501476
To the Sine of the Sun's Longitude 52d. 46m.	9.901067

That is one Sign (30d. making a Sign) and 22d. 46m. from *Aries*, becauſe the Declination is North and increaſing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreaſing, it muſt have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By Gunter.

The Extent of the Compaſſes from the Sine 23d. 29m. the greateſt Declination to Radius, S. 90d. will reach from S. 18d. 30m. the Sun's preſent Declination, to 52d. 46m. the Sun's Longitude as above.

PROB. III.

The Sun's Place and greateſt Declination given to find the Right Aſcenſion.

Example.

The Sun's Place 10d. 30m. in *Aquarius*, the Right Aſcenſion is required.

The Operation by the Logarithms.

As Radius	10.000000
To the Tangent of the Sun's Longitude from *Aries* 49d. 30m.	10.068501
So is the S.c. of the greateſt Declination 23d. 29m.	9.962453
To the Tangent of the Sun's Right Aſcenſion 47d. 2m.	10.030954

By Gunter.

The Extent from Radius S. 90d. to S.c. of the greateſt Declination 66d. 41m. will reach from Tangent Sun's Longitude from *Aries* 49d. 30m. to the Tangent of the Right Aſcenſion 47d. 02m. required.

Note, This Proportion gives the Sun's Right Aſcenſion from the next Equinoctial Point; but it ought to be accouted from *Aries* according to th Order and Succeſſion of the Signs, and therefore in this Caſe 47d. 2m. ſubtracted from 360d. (becauſe the Sun is in the 4th Quarter of the Ecliptic, or South decreaſing) gives 312d. 58m. the Right Aſcenſion from *Aries*.

PROB. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude.

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude?

The Operation by the Logarithms.

As S.c. of the Latitude 51d. 32m.	9.793832
To Radius	10.000000
So is the S. of the Declination 15d. 20m. North	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	9.628486

By Gunter.

The Extent from the S. c. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, will reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is alſo South.

PROB. V.

The Latitude of a Place, and the Sun's Declination given, to find the Aſcenſional Difference.

Example.

Suppoſe in the Latitude 51d. 32m. North, the Sun's Declination is 10d. 45m. North, and the Aſcenſional Difference required.

The Operation by the Logarithms.

As Tangent Complement of the Latitude 51d. 32m.	9.900086
To Radius	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	9.278424
To the Sine of the Aſcenſional Difference 13d. 49m.	9.378338

By Gunter.

The Extent from Tangent 38d. 28m. (the Complement of Latitude) to. Tangent 10d. 45m. the Sun's Declination; will reach from Radius S. 90d. to S, 13d, 49m, the Sun's Aſcenſional Difference as above.

PROB. VI.

To find the Oblique Aſcenſion and Deſcenſion.

Firſt, Find the Aſcenſional Difference by the Fifth Problem.

Secondly, The Right Aſcenſion by the Third Problem.

When the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference ſubtracted from the Right Aſcenſion, gives the Oblique Aſcenſion, and added thereto, gives the Oblique Deſcenſion; but when one is North and the other South, the Aſcenſional Difference added to the Right Aſcenſion, gives the Oblique Aſcenſion, and ſubtracted gives the Oblique Deſcenſion.

Note, That if the Aſcenſional Difference exceed the Right Aſcenſion, add to the Right Aſcenſion 360 Degrees, then ſubtract the Aſcenſional Difference therefrom.

Or, if both being added together exceed 360 Degrees, the Exceſs is the Oblique Aſcenſion or Deſcenſion.

PROB. VII.

To find the Time of the Sun's Riſing and Setting, and Length of the Day or Night.

Find the Aſcenſional Difference by the Fifth Problem, which convert into Hours and Minutes of Time, accounting for 15 Degrees of the Equinoctial one Hour, and for every Degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Aſcenſional Difference added to ſix Hours, gives the Time of Sun-ſetting; and ſubtracted is the Time of Sun-riſing.
2. But if one be North and the other South, then the Aſcenſional Difference added, gives the Time of Sun-riſing; and ſubtracted is the Time of ſetting.

The Time of Sun-ſetting doubled, gives the Length of the Day; the Time of Sun-riſing doubled, is the Length of the Night.

Example.

In Latitude 51d. 32m. North, ſuppoſe the Sun's Declination 21d. 57m. North, the Aſcenſional Difference is 30d. 29m. which reduced in Time is

	H. M. S.		H. M. S.		
	2 01 56				
	6 00 00				
Sun ſetteth—	8 01 56	doubled is	16 03 52	length of the	Day.
Sun riſeth —	3 58 04		07 56 08		Night.

PROB. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth.

The RULE.

Take the Complement of the Altitude, the Compl. of the Latitude, and the Compl. of the Declination, add them together, and take the half Sum; ſubtract the Compl. of the Declination from the half Sum, and take the Remainder; then ſet down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl. Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of theſe four Logarithms is the S.c. of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90d. you muſt add 90 Degrees thereto, and then proceed as before.

Example I.

In the Latitude 51d. 32m. North, the Sun's Declination is 20d. 30m. North, his Altitude 47d. 30m. and his Azimuth from the North required.

The Operation by the Logarithms.

d.	m.		
42	30	Compl. Altitude A.M. ——— S. Co. Ar. —	0.170317
38	28	Compl. Latitude North ——— S. Co. Ar. —	0.206168
69	30	Compl. Declination N. or Sun's Diſtance from the Pole.	
150	28	Sum	
75	14	Half Sum ——— S. ——	9.985414
5	44	Exceſs of the Half Sum above c. Decl. S. ——	8.999559
		Sum	19.361458
61d.	21m.	——— Sc. ——— Half Sum	9.680729
61d.	21m.		

doubled 122d. : 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's *Scale*

The Extent of the Compaſſes from Radius S. 90d. to S. 42d. 30m. the Complement of the Altitude, will reach from S. 38d. 28m. the Complement of the Latitude, to Sine 24d. 40m. then the Extent from Sine 24d. 40m. to Sine 75d. 14m. the half Sum, will reach from S. 5d. 44m. (the Exceſs of the half Sum, above the Complement Declination) to 122d. 42m. (upon the Line of verſed Sines) which is the Azimuth required.

Example 2. In the Latitude of 51d. 32m. North, the Sun's Declination is 18d. 15m. South, his Altitude 17d. 45m. and the Azimuth from the North required?

The Operation by the Logarithms.

d.	m.		
72	15	Compl. Altitude ———— S. Co. Ar.	0.021183
38	28	Compl. Latitude ———— S. Co. Ar.	0.206168
108	15	Declination 90 Degrees being added, becauſe South.	
218	58	Sum	
109	29	Half Sum ſupp. to 180d. is 70d. 31m. S. ——	9 974391
1	14	Remainder ———— S. ——	8.332920
d.	m.	Sum	18.534666
79	20	—— S.c. —— half Sum ——	9.267333
79	20		

Which doubled is 158 : 40 the Azimuth from the North required.

By Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Comp. Altitude will reach from Sine 38d. 28m. the Complement Latitude, to S. 36d. 20m. then the Extent from Sine 36d. 20m. to 70d. 31m. the Supplement of 109d. 29m. (the half Sum) to 180d. will reach from the Remainder 1d. 14m. to 158d. 40m. (upon the Lines of verſed Sines) the Sun's Azimuth as above.

In South Latitude the Operation is the ſame with the two preceding Examples, only the Azimuth is found from the South.

After the ſame Manner you may find the Azimuth of any Star.

PROB. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude of 51d. 32m. North, ſuppoſe the Sun's Declination 23d. 29m. North, the Altitude 36d. 30m. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude, add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and take the Remainder, then ſet down the Complement Arithmetical of the Sine Complement of the Declination, and Complement of the Latitude, and thereto add the Sines of the half Sum and Remainder; half the Sum of theſe four Logarithms, is the S.c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by Logarithm.

d.	m.			
66	31	Compl. Declination	S. Co. Ar.	0.037547
38	28	Compl. Latitude	S. Co. Ar.	0.206168
53	30	Compl. Altitude		
158	29			
79	14	Half Sum	Sine	9.992287
25	44	Remainder	Sine	9.637673
			Sum	19.873675
d.	m.			
30	09	S.c.	Half Sum	9.936837
30	09			

which doubled is 60 18, and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$ the Hour of the Day in the Afternoon.

But if it be in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ ſubtracted from 12 hours, leave 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been Southerly, then inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as in the ſecond Example of the Eighth Problem; do the ſame when the Declination is North in South Latitude.

By Gunter.

The Extent of the Compaſſes from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Verſed Sines) the Hour of the Day as above.

PROBLEM X.

Having the Latitude of the Place, the Sun's Right Aſcenſion, with the Right Aſcenſion, Declination, and Altitude of a Star given, to find the Hour of the Night.

Example.

In the Latitude 51 deg. 32 min. North, on the 18th of *January*, 1765. the Sun's Right Aſcenſion is 20 hours 2 min. the Right Aſcenſion of the *Lion's-Tail* was 11 hours 37 min. the Declination 15 deg. 54 min. North, the Altitude 30 deg. 30 min. to the Eaſtward of the Meridian, the Hour of the Night required.

The RULE.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Star's Altitude; add them together, and take the half Sum, ſubtract the Complement of the Altitude from the half Sum, and reſerve the Remainder; then ſet down the Complement Arithmetical of the Sines of the Complement of the Star's Declination, and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of theſe four Logarithms, is the S.c. of half the Star's Diſtance from the Meridian.

The Operation by Logarithms.

d.	m.			
74 :	6	Comp. Star's Declination	S. Co. Ar.	0.016942
38 :	28	Compl. Latitude	S. Co. Ar.	0.206168
59 :	30	Compl. Star's Altitude		
172 :	04			
86 :	02	Half Sum	Sine	9.998958
26 :	32	Remainder	Sine	9.650034
			Sum	19.872102
		30d. 20m. S.c.	Half Sum	9.936051
		30d. 20m.		

which doubled is 60d. 40m. and reduced into Time, gives four Hours, two Minutes forty Seconds, or three quarters of a Minute nearly.

By the Directions given in the Uſe of the Table of the Sun's Right Aſcenſion, and of the Right Aſcenſion and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eaſtward of the Meridian, ſubtract the Star's Diſtance from the Meridian in Time, from the Time of the Star's coming upon the Meridian;

But if the Star be to the Weſtward of the Meridian, add the Star's Diſtance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the Hour of the Night. In this Example, the Sun's Rght Aſcenſion 20 Hours 02 Minutes, ſubtracted from the Star's Right Aſcenſion (with 24 Hours added thereto) 35 Hours 37 Minutes, leaves 15 Hours 35 Minutes, the Time of the Star's coming on the Meridian; from which ſubtracting 4 Hours, 3 Minutes, 40 Seconds, the Hour above found, leaves 11 Hours, 31 Minutes, 20 Seconds, the Hour of the Night.

Note farther, If the Star's Declination be South in North Latitude, or North in South Latitude, inſtead of taking the Complement of the Declination to 90 deg. there muſt be 90 deg. added thereto, as has been ſhewn in the Eighth preceeding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compaſſes from Radius S. 90 deg. to the S. of 74 Degrees 6 Minutes, the Complement of the Star's Declination, will reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 45 Minutes; then the Extent from the S. 36 Degrees 45 Minutes, to S. 86 Degrees 2 Minutes the half Sum, will reach from S. 26 Degrees 32 Minutes the Remainder, to 60 Degrees 40 Minutes (upon the Line of Verſed Sines required;) with which proceed as has been directed to find the Hour of the Night.

Courſes and Diſtance between ſome of the moſt eminent Places on the Coaſt of England, *&c. As alſo the thwart Courſes between the Eaſt Coaſt of* England *and* Holland, *the South Coaſt of* England *and* France, *and the Weſt Coaſt of* England *and* Ireland.

	Leag.
FROM *Whitby* to *Tinmouth*, NW. by N.	14
From *Buchaneſs* to *Cathneſs*, North Weſt	27
From the *North Foreland* to *Fluſhing*, Eaſt	24
From the *North Foreland* to the *Texel*, NE. by N. half E.	50
From the *Spurn* to the *Texel*, Eaſt by South	55
From *Tinmouth* to the *Naze* of *Norway*, NE. by E.	118
From *Tinmouth* to *Holy Land*. Eaſt by South	110
From *Tinmouth* to the *Scaw*, Eaſt North Eaſt	110
From *Yarmouth* to the *Texel*, Eaſt by North	34

	Leag.
Fom *Newcaſtle* to *Maes Deep*, ENE.	83
Fom *Aberdeen* to *Maes Deep*, South Eaſt	113
From the *North Foreland* to the *Maes*, ENE.	30
From *Newcaſtle* to the *Fly*, ESE.	90
From *Scarborough* to *Holy Land*, Eaſt Northerly	97
From the *Start* to the *Eddyſtone*, Weſt half South	7
From the *Land's-end* to *Scilly*, WSW. three quarters Weſt	9
From the *Caſkets* to *Blakeneſs*, Eaſt North Eaſt	55
From *Beachy* to *Blakeneſs*, Eaſt a quarter North	15
From *Dover* to *Diep*, South half Weſt	25
From the *Lizard* to *Guernſey*, Eaſt by South	35
From the *Start* to *Seven Iſles*, South half Eaſt	25
From *Scilly* to *Uſhant*, South Eaſt by South	35
From the *Lizard* to *Uſhant*, South	29
From *Hartland Point* to the Iſland of *Lundy*, North	3
From *Lundy* to the *Holms*, Eaſt by North, Northerly	18
From *Black Rock* to *Tuſkar*, Eaſt North Eaſt	3
From Cape *Clear* to *Old Head*, Eaſt by North	13
From *Greſholm* to *Waterford*, Weſt by North	21
From the *Land's-end* of *England* to *Tuſkar*, North by Weſt	40
From the *Land's-end* of *England* to *Waterford*, NNW.	40
From *Holy-Head* in the Iſland *Angleſea*, to the Bar of *Dublin*, W. by N.	18
From *Rochel* to *Black Rock*, South by Eaſt	80
From the *Land's-end* of *England* to *Cape Clear*, NW. by W.	55
From the *Land's-end* of *England* to *Old Head*, North Weſt	45

A TABLE *of the Soundings coming into the* Channel, *reſpecting the Bearings and Diſtances of* Scilly, Uſhant, *the* Lizard, *&c. with the Depth in Fathoms, and the various Sorts of Ground.*

	Bearings.	Diſtance.	Lat.		Depth of W.	*The various Sorts of Gronnd*
			D.	M.		
Scilly.	South	05	50	20	50	Branny ſand, like ground wheat
	S S E.	05	50	12	45	White ſand mixed with ſhells
	S S E.	06			50	Coarſe ouſe
	E S E.	06			53	Coarſe ſand, and fine red ſhells
	E by S.	08	50	12	78	Ouſe ſand, Queens ſhells amongſt it.
	E by N.	07	49	15	72	Ouſe like muſtard ſeed with broken ſhells
	E by N.	15	48	50	72	Pepper ſand, black and yellow.

	Bearings.	Diſt.	Lat. D.	Lat. M.	Depth	*The various Sorts of Ground.*
Scilly.	E. by N.	24	49	50	72	Black, white and red ſtones with ouſe.
	E N E.	07	49	15	60	Some black ſand.
	E N E.	20	49	15	80	Rocky ground.
	E N E.	55			103	Fine white ſand.
	NE by E.	22	49	10	85	Sand and ouſe together.
	NE by E.	10	49	20	55	White and red ſand mix'd with ſhells.
	NE by E.	50	49	50	100	White ſand with ouſe and nits.
	NE by E.	25	49	50	64	Branny ſand with white and red ſhells.
	NE by E.	06	49	10	48	Black ſand.
	NE by E.	13	49	43	65	Branny ſand with ſome pieces of ſhells.
	North Eaſt	10	49	40	65	Branny ſand, ſmall ſtones, herring bones.
	NE by N.	10	49	20	57	Small red ſand.
	N N E.	10	49	47	100	White ſand then entring on the bank.
	N by E.	18			68	Red ſand with black and white ſcollop ſhells.
	North	12	49	15	65	Broken ſhells with white and red ſand.
	North	10	49	47	65	White ſand on the Eaſt-part of the bank.
	N N W.	33	48	52	77	Red ſand and ſhells amongſt it.
	NW by N.	07	49	40	54	More ſhells, the *Lizard* NE. diſt. 18 leag.
	North Weſt	04	50	10	50	Branny ſand with black and broken ſhells.
	North Weſt	07	49	47	60	Stony ground.
	NW by N.	04	50	25	61	Red and black ſand, with gliſtering ſhells.
	NW by W.	2½			44	Shells and ſand like points of needles.
	W by N.	13	50	25	63	Fine white ſand with little ouſe.
	Weſt	21	50	08	66	Red and black ſand with gliſtering ſhells
	W by S.	32	49	50	75	Fine white ſand and gliſtering ſhells
	W by S.	3½			40	Like broken wheat or coarſe Bran.
Uſhant.	North	06	48	36	63	Full of ſmall maes ſand.
	N by E.	18	48	15	80	Round ſtones mixed with ſcollop ſhells
	NE by N.	11			60	Small beaten ſhells and hakes teeth.
	North Eaſt	29	48	50	85	Great and ſmall pieces of cockle ſhells.
	North Eaſt	25	48	10	55	Grey and brown ſand with white ſhells.
	NE by N.	07	48	30	68	White and grey maes ſand.
	E N E.	14	48	36	68	Small ſhells and herring-bones.
	E by N.	25	48	30	85	White and grey ſand with ſmall red ſtones.
	Eaſt	18	49	00	70	Branny ſand with ſome ſhells.
	Eaſt	06	49	00	65	Red ſand, ſhells, things like needle points.
	Eaſt	15	49	15	70	Fine white ſand.
	Eaſt	33	49	15	87	Dazling ſand like barley-ſtraw.
	Eaſt	04	49	10	60	Full of maes ſand and broken ſhells.

	Bearings.	Dist.	Lat.		Depth	*The various Sorts of Ground.*
			D.	M.		
Uſhant.	E by S.	14	48	56	63	Shells like Perriwinkles.
	E S E.	15	48	15	70	Shells grey and red pieces of Cockle ſhells.
	E S E.	12	49	29	68	Groſs white ſand with ſhells.
	E S E.	8	49	5	64	White ſhells and fine ſmall ſtones.
	E S E.	6			61	Hakes teeth and ſhells like oatmeal huſks.
	SE by E.	20	49	15	72	Great ſtones like peaſe and beans.
	SE by E.	9	49	15	55	Sand and ſome ſhells.
	SE by E.	37	48	30	55	ſames's ſhells.
	SE by E.	15	49	25	50	Small ſcollop ſhells, with ſome ſtones.

	Bearings.	Dist.	Depth	*The various Sorts of Ground.*
Lizard.	North Eaſt	6½	43	Marſhy ſhells and ſome ſcollop ſhells.
	NE by N.	10	5[illegible]	Marſhy ſhells and Hakes teeth.
	N N E.	9	50	Marſhy ſhells like Oatmeal huſks.
	N by E.	15	58	Marſhy ſhells and Hakes teeth.
	North	1	39	Stones as big as Beans four Leagues off.
	North West	5	45	Grey ſand like Oatmeal flour.
	North Weſt	3	46	Marſhy ſhells like ſmall ſtones.
	W N W.	3½	47	Small ſhingly ſtones, and marſhy ſhells.
	W by N.	4	40	Fine marſhy ſhells like white ſtones.
	W by S.	3	41	Black gravelly Ground with ſmall ſtones.
	NE by E.	12	57	Scollop ſhells.
	NE by E.	4	44	Great ſtones and rough Ground.
	North Eaſt	6½	50	Like Huſks of Oatmeal and ſmall ſtones.

Eddyſtone.	N. ½ a Mile		35	Dirty brown ſand and Hakes teeth.
	W. 2 Miles		34	Dirty brown ſand.
	S. 1 Mile.		26	Fine ſand, and within this 28 and 30 fathom.

Start.	N by E.N. ly	8½	40	Like the Duſt of a Grindſtone with Hakes Teeth and ſhells.
	NW. by W.	4½	43	
	NW. by N.	3	38	Gravelly ſand, ſmall ſtones and ſhells.
	NbyWW.ly.	12	38	Rediſh ſhells maſhed as if beat in a mortar. white ſand and ſcollop ſhells.
	NW by W.	14	43	

Foreland

	Bearings.	Diſt.	Depth	*The various Sorts of Ground.*
Foreland.	NE by E.	08	35	Small ſhingly ſtones as big as Peaſe.
	North	08	40	Streamy Ground with ſmall ſtones.
	N by E.	5½	33	The ſame with ſome black ſand.
	NE by N.	11	41	Fine ſand and ſcollop ſhells.
	N N E.	08	40	Fine ſand, ſcollop ſhells and ſmall ſtones.
	NE by E.	2½	27	Shingly ground.
	W N W.	2½	20	Small ſtones.
Needles	NE by E.	02	17	Great ſhingly Ground.
	NE half E.	2½	17	Small ſhingly Ground.
	North Eaſt	02	13	Rocky Ground.
I Wight	N by W.	3½	20	All the Ground from St. *Alban*'s to the Eaſt-end of the *Wight* is chalky and brown Sand.
	E by N.	04	21	
	N by E.	03	18	
Dunnoſe.	W by S.	04	16	Rough Ground with ſome big ſtones.
	Weſt	04	21	A kind of ſandy fiſhy Ground.
	W N W.	08	33	Fiſhy Ground ſomewhat red, with ſtones as big as Peaſe, and ſmall Beans.
	N by W.	06	26	

Directions to ſail into ſome of the Principal Harbours on the Coaſt of England.

Directions to ſail into Scilly.

SCILLY is divided into divers Iſlands; along the Weſt-ſide lieth a great many Rocks. There are ſeveral Channels through which to go in, but the Southermoſt called St. *Mary*'s Sound is the beſt, being a fair opening of the Channel, but near the Midſt lie two ſunken Rocks, which in foul Weather the Sea may be ſeen to break over: It is beſt to leave them on the Larboard-ſide going in, and on the Starboard-ſide coming out. Go ſo near the Starboard-ſhore, as that a Stone might almoſt be thrown on it. And when you are within the Point, luff up round, and come to an Anchor in Sight of the Houſes; or when the Town is brought open to the Valley, leave two-thirds of the Harbour on the Larboard-ſide.

Directions to ſail into Mount's-Bay.

To Anchor in Gover's-Lake.

There are two ſunken Rocks, which lie right in the Way of going into the Lake, about a Mile without your anchoring Place; theſe Rocks lie NNW. and SSE. about half a Mile in length, to ſhun which, obſerve the following Directions.

If the Wind is in the Eaſtern Hank, give the Eaſtern Shore about a League's Birth, and keep St. *Paul's* Church wholly in Sight above the Hill, 'till you bring a Church on the Eaſtern Shore a Sail's Breadth to the Northward of St. *Michael's* Mount, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul's* Church down under the Hill, then let go your NE. Anchor, and carry the other to the SW. and you will be well moor'd, and in good fine Ground, all Sand.

You may come in, keeping one half of the Church above the Hill, you'll go clear of them to the Eaſtward, and when it ſhuts down you are to the Weſtward of them, and when upon them, the Top of the Tower and a long Hedge is in one, about 6 or 7 Feet at low Water.

If the Wind is in the Southern or Weſtern Hank, keep the Land on board, which is bold; you may go within a Quarter of a Mile of the Point; run till you ſhut *Mouſehole* Iſland in, and St. *Paul's* Church down under the Land well, to come too with your SW. Anchor, then carry the other to the NE. you will be well moor'd in fine Ground as before-mentioned: Be ſure to have the Church on the Eaſtern Shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good, your Anchors will never ſtart, the Wind at SSE. or SE. heaves in a great Sea, and raiſes a great Ground Sea when it blows hard; the harder it blows you have a ſtronger Outſet in your Favour; there is no Tide, you always ride Head to Wind, your Anchors will ſooner ſtart with the Wind to the N. or NW. becauſe the Ground goes out with a little Deſcent.

To ſail into Foy.

Foy may be very eaſily known, lying in between two high Lands; on the Weſt-ſide going in, is an old Church and Caſtle, and on the Eaſt-ſide the Ruins of an old Church, as you may ſee by the making of it in Capt. *Collin's* Draught of *Foy.* The going in is a Cable's Length over from Side to Side, and no Danger; when you are in you may Anchor before the Town, or run up above the Town. In the Time of the *Dutch* War, in the Year 1666, there was above ſixty Sail of *Virginia* Ships put into this Harbour. This Place lieth NE. and SW. in and out, which makes it a better Out-let to the Weſtward than *Plymouth* or *Falmouth.* And whereas it hath been reported to be a Bar Harbour, and that you cannot enter till half Tide, I do aſſure you that there is no leſs than three Fathom at Low-water at a Spring-Tide; here you may lie aſhore to waſh, tallow, or ſtop Leaks; the Spring-Tides riſe and fall 16 or 17 Feet, and it is High-water here at Full and Change a Quarter paſt Five. There is good Anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To ſail into Falmouth.

Upon the Weſt Point of the Haven of *Falmouth*, ſtandeth a Caſtle on the high Land, called *Pendennis* Caſtle. In the Entry neareſt the ſaid Weſt-ſide, lieth a Rock above Water, you may ſail in on either Side of it, on the Inner-ſide of the Eaſt Point lie alſo ſome Rocks off the Shore; on the Eaſt ſide is deepeſt Water, and moſt Room, therefore in going in, give the Eaſt-Point a large Birth; there will be 7 or 8 Fathom. Keep the ſaid Shore till you come within St. *Maud*'s Caſtle; which when it bears Eaſt, there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; obſerve in going in to keep the *Manacles* open and ſhut on the Point of *Falmouth* Caſtle, and ſo it muſt be kept till you ſhut the Church over *Penny Comquick*, into the North Eaſt-end of the *Smithick*, and ſo bear over to St. *Maud*'s, and ride with the Caſtle Eaſt, laying one Anchor in 18 Fathom, and the Weſtermoſt Anchor in four Fathom, as ſhall be moſt convenient.

To ſail into Plymouth.

At the Eaſtermoſt Point of *Plymouth* Sound lieth a high round Rock called *Mewſtone*; between it and *Ramhead* lieth the ſaid Sound, North North Eaſt, being round and deep.

A little to the Northward of *Ramhead*, is a fair ſandy Bay, where is good Anchoring cloſe under the Land, in 9 or 10 Fathom: South a little Eaſterly from *Ramhead*, lies a Rock above Water called the *Eddyſtone*, (on which is erected a Light-houſe) the Point of *Plymouth* lies from it N. by E. diſtant about 4 Leagues.

In the Sound, by the Land of *Plymouth*, lieth an Iſland called St. *Nicholas* or *Drake* Iſland, which is joined to the Weſt-ſide with a Range of Rocks under Water, ſo that you may ſail along to the Eaſtward of it.

To ſail into Catwater.

To ſail into *Catwater*, run in between the Iſland and the Point on the Eaſt-ſide of the Land of *Plymouth*, till *Catwater* open on the Starboard-ſide, then go in to the Eaſtward between the Point of *Plymouth*, and the

Point, on the Starboard-ſide, leaving moſt Part of the Channel on the Starboard-ſide, until you come within the Point, and anchor there right againſt the high ſteep Northern Land; there is at Low-water, with extraordinary high Tides 4 and 5 Fathom.

In ſailing into *Catwater*, be ſure to give a good Birth to the Southern Point of the Entry, for there lies off the ſaid Point a Ledge of Rocks under Water, about two Cables Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about twelve Feet Water at half Flood, which Buoy muſt be left on the Starboard-ſide going in, and when *Catwater* is altogether open you may run in to the Eaſtward, leaving in the Entry of the Harbour two-thirds of the Channel on the Starboard-ſide, as aforeſaid, becauſe the South-ſhore is ſomewhat flat off, there lying a ſandy Bank, which reaches to the Second Point of the South-ſhore of *Catwater*.

A little to the Eaſtward of *Drake* Iſland lies a Rock under Water, upon which at Low-water it is not deeper than two Fathom. To ſail within the Land you may go to the Eaſtward or Weſtward of the Rock, as Occaſion ſerves.

To ſail into Dartmouth.

Dartmouth hath a narrow Entrance lying in between two high Lands: On each Side of the Haven ſtandeth a little Caſtle; on the Weſt-ſide is a Church on the high Land, called St. *Patrick*'s Church. To ſail in, coming from the Weſtward run in along by the Weſt Land, ſo far to the Eaſtward until the Key of the Village (on the Eaſt-ſide of the Haven) be brought in the midſt of the Entry of the Haven between the two Lands: It's convenient to have a Boat ready (if any Guſt of Wind ſhould come from the high Land) to tow in. Being come in, edge over to the Weſt-ſide before the Brewhouſe, and anchor there in 10 or 11 Fathom, or before the Village to the Eaſt-ſide at Pleaſure; At the Eaſt-ſide lieth a ſunken Rock, to avoid which ſteer in with St. *Patrick*'s Church, and do not bring the Village which ſtandeth on the Weſt-ſide of the Harbour, without the ſaid Church, but keep the outer Houſe of the ſaid Village in the Eaſt-ſide of the Chapel, always in Sight, without the Bulwarks on the North-ſide by St. *Patrick*'s Church, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, neareſt to *Dartmouth*, ſtandeth a white ſquare Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To ſail into Torbay.

Bring the Weſt Point of the *Berry* S. by E. or SSE. from you; and anchor there in 7 or 8 Fathom, where you ſhall be Landlock'd for a S. and

SW. Wind. At the North Eaſt-end of the Bay is alſo a Tide Haven called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fathom, according as you deſire to be nearer or further from the Shore.

Directions for ſailing in at the Eaſt-end of the Iſle of Wight *to* Portſmouth Harbour, *and alſo to* Hampton.

If you come from the Eaſtward with a Northerly Wind, bound into the *Iſle of Wight* or *Portſmouth*; after you come to the Weſtward of the Shoal called the *Ower*, hale in North Weſt with St. *Hellen*'s Point; but do not hale too much to the Northward, for there lies a Bank off of *Langſtone* Haven to the Eaſtward of the *Horſe*, that hath not above 13 Feet on it at Low-water; but keeping in 7 or 8 Fathom, carrieth you clear without it, and will bring you to the SE. End of the Sand called the *Horſe*. St. *Hellen*'s Church being SW. by W. from you, you may run in 5 Fathom, and when you have brought the Weſtermoſt great white Patch, or Chalk upon *Poſt Down* (which is the high Land to the Northward of *Portſmouth*) a Ship's Length to the Weſtward of *South-Sea* Caſtle that ſtands upon the Beach, then you may luff up without Fear: Being then to the Weſtward of the *Horſe*, and ſteering with that Mark, it will lead you in along the *Horſe* unto the Beach, and ſo into the Harbour of *Portſmouth*, keeping along cloſe by the Shore, until you come by the Town-wall's End, and there you muſt bear off a little for a Flat, that lieth off from the Shore, this is for an Eaſterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown-Down*, (which is to the WNW. of *Haſlewood* Point) within a Ship's Length without the ſaid Point, then you may bear to the Weſtward along the Outſide of the *Spit*, which is the Shoal on the Weſt-ſide of the Entrance of *Portſmouth* Haven.

If the Wind be Weſterly or Southerly, and you are coming from the Weſtward, and deſign for St. *Hellen*'s Road or *Stokes-Bay* (from *Dunnoſe* to St. *Hellen*'s Point, the Courſe is NE. by N. and NNE.) but borrow no nearer to St. *Hellen*'s than 6 or 7 Fathom, for the Spit lies off a great Way; but if it be clear Weather, that you may keep *Sand-Down* Caſtle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; ſteer along in this Mark until you open St. *Hellen*'s Church about two Ship's Length open of the *Red-Cliff* within St. *Hellen*'s Point or *Port-Sea* Caſtle to the Eaſtward of *South-Sea* Caſtle, then are you clear of the Point, and may ſteer to St. *Hellen*'s Road NW. and having brought the Point S. by W. or between that and the S. by E. you may anchor in 7 or 8 Fathom Water, on very good Ground.

Note, That you have no good clear Ground all along the Iſland, until you have opened St. *Hellen*'s Church, as aforeaid, and have brought the Point to bear from you SSW.

From St. *Hellen*'s Point, to go between *No-Man's-Land* and the *Horſe*, the direct Courſe in, is NW. by N. and NW. but you have no Shoaling upon the SW. ſide of *No-Mans-Land*, for you have 16 Fathom, and the next Caſt but 3; but at the *Horſe* you may ſtand into 10, 9 or 8 Fathom: If the ſtrong Tide be ſpent, and ſmooth Water, you ſhall have a great waſhing of them by the Overfall of the Water; but eſpecially on *No Man's-Land*, if it be clear Weather, there are two very good Marks to lead you in, which are as follow; keep the two Windmills on the *Downs* on the Iſle of *Wight*, that they may be ſeen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and ſo up all along the Iſland without ſome middle Ground that lieth SSW. off the Point *No-Man's-Land*.

Alſo from St. *Hellen's* Point (if it be clear Weather that you can ſee it) there is a direct Mark, *viz.* a Part of an Old Caſtle formerly called *Haſlewood* Caſtle, ſtanding on *Gilkicker* Point (which is kept white,) keep *Goſport* Church and that Caſtle in one, or this Caſtle in the Middle of the Wood about the Church, which ſheweth with a Valley like a Saddle, and ſo you may run directly in without Fear. Or if the Wind be ſo that you are forc'd to turn in, then you may run the ſaid Mark within two Sail's Breadth of each End of the Wood. In the Middle of the Channel is about 11 Fathom Water; and if you bring the ſaid Mark right under the North End of the Wood, you ſhall run in a middle Ground near the *Horſe*, that hath not above 10 Feet on it at Low-water, and hard Sand.

Being in *Yarmouth* Road, and you would ſail out of the *Needles*, ſteer away from *Hurſt* Caſtle, which Place is very ſteep; being paſt the Caſtle, ſteer away for the *Needles*, which are ſharp white Rocks; giving a Birth to ſome Rocks that lie off from the Iſland-ſide in the Fair-way, between the Caſtle and the *Needles*, you muſt keep cloſe to the *Needles*. The Tide of Ebb ſetteth on the *Shingles*, which are hard Stones. The Flood ſetteth on the *Needles*.

To ſail into the *Needles*, you will know the going in by the high white Land which is the Weſt-end of the *Iſle of Wight*; run boldly in with the Land, till you ſee the *Needles* Rocks, and then keep cloſe to them, obſerving the Tides, as in the Directions coming out. *Note*, That there is a ſtrong Indraught that ſets in at the *Needles*, and into *Pool*; which Indraught hath haul'd many Ships into *Freſhwater* Bay. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight*.

To ſail within the Wight *in thick Weather.*

To ſail between the Main and the *Wight* in thick Weather, borrow in 6 Fathom off St. *Hellen*'s, and ſteer NW. by N. and NNW. from St. *Helle'ns*

Point, till you have 12 Fathom, and then ſteer more Weſterly, as you find the Depth; come no nearer *No-Man's-Land* than 9 or 10 Fathom; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly; but if it be large keep in 14 or 15 Fathom, which is a good Birth from both Sides, and ſo ſteer W by S. and WSW. as you find the Depth until you come to *Cowes*. *Note*, That being about *Stoke's-bay*, there will be leſs Water; if you go nearer to *Cowes*, there you may anchor in 12 or 14 Fathom, in the midſt of the Channel, where is ouſey Ground.

Directions for Dover-Road.

The beſt Ground in *Dover-Road* is with the *Whiteway*, to the NW. of *Dover-Caſtle*, or between that Hill that comes from St. *James*'s Church, which is a flat Steeple at the North-end of *Dover* Town, for a thwart Mark, and ſo in what Depth you pleaſe, from 12 to 14 Fathom. Thwart of *Foulkſtone* in 12 or 14 Fathom is very good Ground.

Direction to ſail into the North-Foreland *through the* Gulls *in the* Night.

If your Ground Tackle ſhould fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *Northſand-head*; if you can ſee but the *North-Foreland* Light, when that Light-houſe bears NW. or NW. by N. then bear over into 8 or 9 Fathom, and being in that Depth (ſteering SSW.) you may be ſure it will carry you directly through with the *Brake*, by keeping your Lead carefully, and borrowing no nearer the *Brake* than five Fathom, nor going without 9 Fathom, or 9 and a half, as you have the Tide under you; this Courſe will lead you through without Danger.

Directions for the North-end of the Goodwin, *for ſuch as ſail from the* North-Foreland *to the Southward in the Night.*

If you be at the *North-Foreland*, bound for the *Downs*, and the Tide falls out too early or too late; to turn into the *Downs* with the Wind at SW. or SSW. take the following Directions.

If it be in the Morning before Day, then be ſure to weigh Anchor in convenient Time, to be at the *North-ſand-head* at the turning of the Tide to the Southward. From the *Foreland* you may ſteer out with a Flood Tide, SE. by E. and SE. or keep the Light of the *North-Foreland* NW. by N. this Courſe will lead you out. But for the more Certainty, be ſure keep the Lead well, and then you may borrow off and on with the foreſaid Winds in 7 or 8 Fathom, and ſteering out with the foreſaid Courſe, you ſhall find the Depth ſuddenly change to 15 or 20 Fathom:

then you may hale cloſe up to the Southward, along the Back of the *Goodwin*, the Eaſtermoſt-ſide of which lies SSW. and NNE. 12 or 14 Fathom, and is not above a Saker-ſhot from the Sand. But if it be in the Day Time, and the Wind blows ſo hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *North-ſand-head*, is a flat Church upon the *Foreland*, called St. *Peter*'s, a Ship's Length to the Northward of *Broad-ſtairs* Pier-head; or borrow upon the Sand by the Lead as aforeſaid, and ſo taking the firſt of the Tide without the Sand, you may ſtand to the South Eaſtward, till the *South-Foreland* bears W. by S. then caſt about, and you ſhall weather the *South-ſand-head*, and be in the *Downs* Road as ſoon as any other Ship that parted with you at the *Foreland*.

Directions for ſailing over the Spits, *the* Wallet, *and by the* Naze *into* Harwich.

Sailing down the *Swin* or *King's-Channel*, and that you would ſail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you muſt obſerve your Tides, for at the *Spits*, the Buoy lieth in 5, 6 and 7 Feet Water at Low-water, and the Paſſage often alters, ſometimes more Water, ſometimes leſs. The Buoy lieth on the Weſt-end of the *Gunfleet-ſand*, and the Eaſt-end of the *Buxey*, bearing from a flat Steeple, called *Great Holland* Church, South by Eaſt. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, ſix, ſeven and eight Fathom Water; the Sands lying without, makes it a moſt excellent Road. There is a good and deep Channel to ſail in at the *Wallet* between the *Gunfleet* and the *Weſt* Rock, but 'tis ſeldom uſed. Being over the *Spits* in the *Wallet*, ſteer away for the *Naze*, which may be known by the Trees, and a Houſe that ſtandeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank, which hath but 5 Feet Water on it at Low-water; and lieth from the *Naze* Trees E. by N. About a Mile and an half from the *Naze* Point, there is about 8 or 9 Feet Water between it and the *Naze* at Low-water; Keep *Payn*'s Trees that lie a little to the Southward of *Harwich*, open and ſhut with *Harwich-Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Cork-land*, juſt open of the *Naze-land*, will carry you on the Bank alſo. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will alſo carry you between the *Pyeſand* and the Ridge, into the *Rowling-Grounds*, where the Ships anchor in 3 or 4 Fathom at Low-water. The Mark to anchor in the beſt off the *Rowling-Ground*, is to bring *Harwich* Windmill two Sails Breadth open of *Harwich-Cliff*: And to ſail from the *Rowling-Ground* to the *Naze*, keep *Payn's* Trees open off *Harwich-Cliff*, till you bring the *Naze*

Naze to bear SW. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to ſail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees SW. ſailing down NE. between the Cork and the Ridge, in 5, 6 and 7 Fath. Water. And when you have brought *Harwich* Steeple on the Brewhouſe that lieth to the Northward of *Languard* Fort, then are you clear of the Cork Ledge; this Channel is much uſed by the Light Colliers going to the Northward.

Being in the *Rowling-Grounds*, and that you would ſail into *Harwich* Harbour, keeping cloſe by the *Andrews*, which is a Sand that lieth off from *Languard* Fort, and is ſteep too on the Weſt-ſide; The Tide of Ebb runneth ſtrong over the *Andrews*, the firſt half Ebb, of which you muſt have a Care. This Sand is dry at Low-water; keep cloſe by the Beach of *Languard* Fort, to avoid the *Altar*, which is a ſmall ſtony Shelf that lieth right Weſt from *Languard* Fort, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 or 6 Feet at Low-water. You may ſail to the Weſtward of it, between it and *Harwich* Cliff, according as the Tide is up, and what Draught of Water your Ship draweth: But if you ſhould want to go into *Harwich* at Low-water, and your Ship draweth above 15 Feet, you may ſtay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that ſtretcheth off from the Beach thwart the Channel, a little within the Brewhouſe, that is to the Northward of *Languard* Fort. Being paſt the *Glutton*, you muſt keep cloſe to the Beach to avoid the *Griſtle*, that lieth in the Middle between *Harwich* and the Beach of *Languard* Fort, on which is but three Feet at Low-water, there is a ſmall Channel between the *Griſtle* and the *Guard*, of nine Feet at Low-water, but when you have opened *Dover* Court Church off *Harwich* Town, then you are clear of the *Griſtle* and the *Guard*, and may anchor before the Town of *Harwich* in five Fathom Water, or run into *Ipſwich* Water and anchor; this is a very ſafe Harbour, and if a Ship ſhould chance to blow a-ſhore ſhe can take no Harm, the Shore being ſoft and ouſey. The Spring Tides riſe 15 and 16 Feet, and the Niep-Tides 10 and 11 Feet:

Directions to ſail into Harwich *through the* Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to ſail over the *Spits*, then keep down by the *Gunfleet-ſand*, in 7 and 8 Fathom Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit* ESE. from the Sand about a Cable's Length; to the Eaſtward of this *Spit* is a ſmall Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood ſetteth ſtrong into the *Wallet*; of which you muſt have a

Care when you come near it, eſpecially in little Winds or Calms, you may be hauled on the *Gunfleet-ſand*; this Sand lieth NE. and SW. and drieth in ſeveral Places: The Buoy of the *Gunfleet* beareth from the *Naze* SE. by E. Eaſterly; you may ſtand into 7 or 8 Fathom along the Side of the *W. Rock* into the *Sledway*, keeping *Balſey* Church N. by W. and NNW. till you bring *Harwich* Steeple on the Brewhouſe (that lieth to the Northward of *Languard* Fort) which will carry you clear of the *Cork Ledge*, on which is two Fathom and an half at Low-water, and then ſtand to the Weſtward, and keep *Orford* Church and Caſtle open of *Balſey* Church a Sail's Breadth, 'till you have the Lights together, keep them ſo till you are paſt the *Andrews*, and then follow the former Directions for ſailing into *Harwich*; you may ſtand in upon the *Platters* into five Fathom, on which Sand is but two and three Feet at Low-water; the *Ridge* hath ſeven Feet at Low-water; a great Part of the *Cork Sand* drieth at Low-water; and lieth in Length NE. and SW. about two Miles and a half long, and a Mile broad: *Weſt Rocks* lie in Length NE. and SW. about three Miles, and two Miles broad, and drieth in ſeveral Places, full of Banks and Swatches, the Ground rocky and ſtony in many Places; there is a ſmall narrow Channel between the *Weſt Rocks* and the *Cork*.

For the more particular Directions for ſailing into theſe and other Harbours in *England*, *Scotland*, *Holland*, *Normandy*, *Bretagne*, &c. ſee the laſt Edition of the COASTING-PILOT, newly Corrected, and Reprinted for J. MOUNT, and T. PAGE, on *Tower-Hill*, *London* with many Additions.

FINIS.